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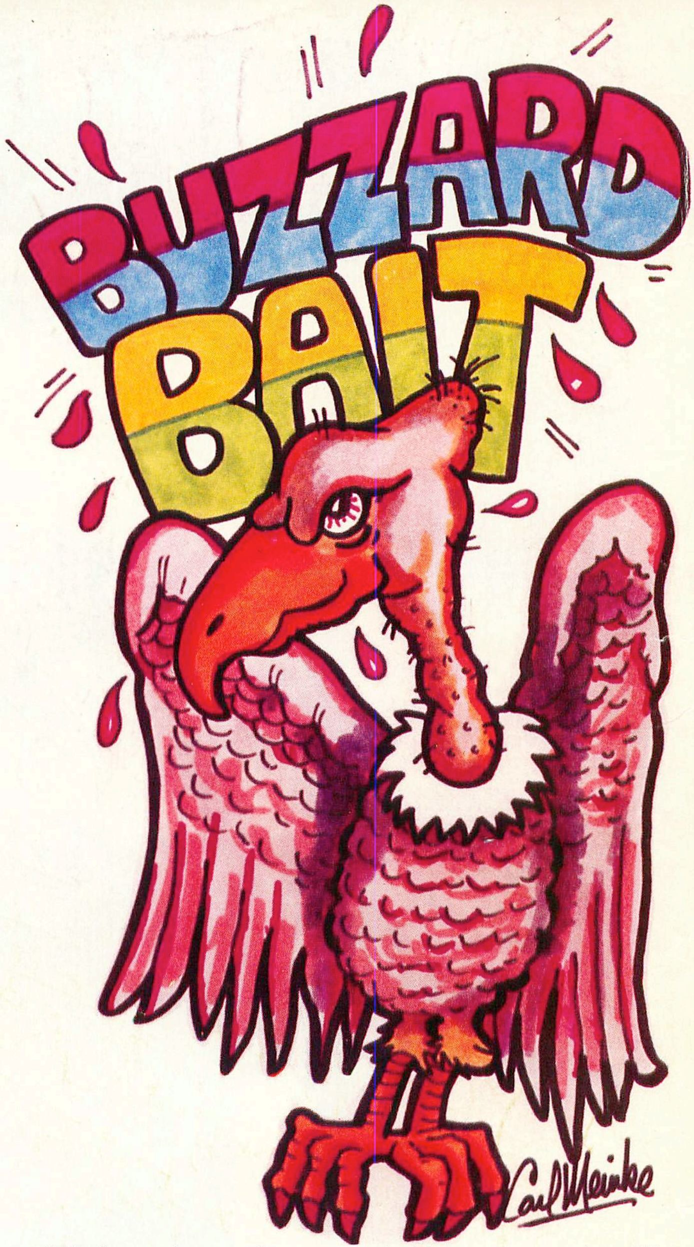
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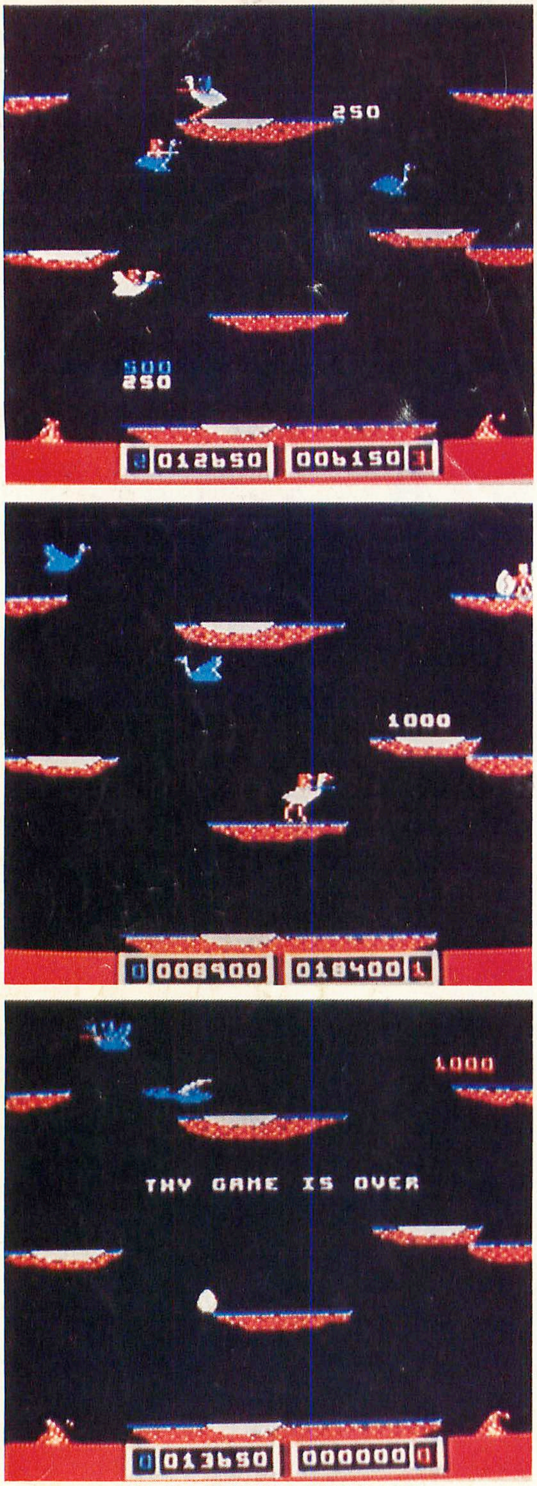
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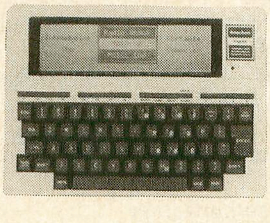
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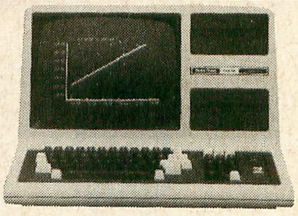
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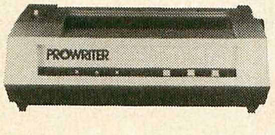
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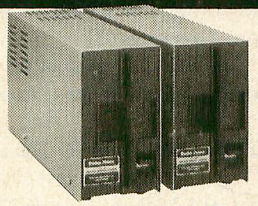
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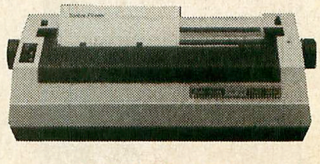
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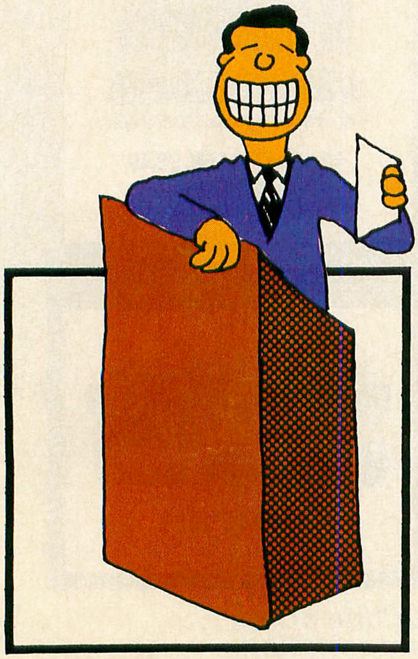
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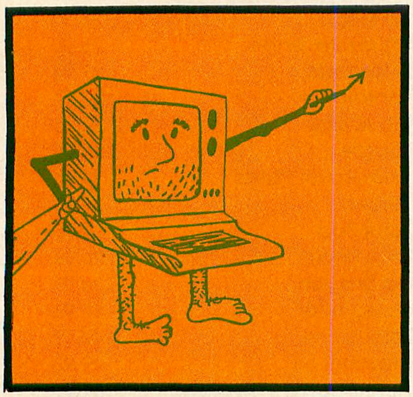
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NEXT MONTH: Since January begins a new year, and the month is named for the twin-faced god Janus, who looks both backwards and forwards at once, the symbolism the month provides lured us into making the January *Rainbow* our beginner's issue. While there'll be plenty of material for the sophisticated, we'll also be running programs and articles specifically geared to the newcomer and those with limited experience on the CoCo. Some old hands such as Jorge Mir will help us all protect against I/O Errors, and among the games and other BASIC programs, you'll find one exercise designed to help newcomers to the keyboard become capable typists.

Look for the January *Rainbow* with all its features you've come to expect and enjoy.

The RAINBOW

December 1983 Vol. III No. 5

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letters to RAINBOW

COMPLIMENTS TO THE CHIEF

Editor:

We read Lonnie Falk's editorial and would like to compliment him on what we feel was a very sensible, thoughtful commentary on an extremely sensitive subject. You are aware of how serious the software theft problem is and how drastically it affects our sales. As you know, none of our software is protected. We rely on the integrity of the public to remain in business and comments such as his will help us to do so.

Ron Krebs
Mark Data Products

Editor:

I have several comments to make about the editorial in the October issue of *Rainbow* concerning pirating.

Just the other day some CoCo friends of mine were discussing this very problem. The general consensus of opinion was that pirating is a result of the nature of the art. To develop a better software protection device is to challenge programmers to break it.

There is also the problem of shoddy programs being sold to people for not so shoddy prices. Just recently I purchased an address and mailing label program which cost $17.95 plus sales tax and $2 shipping. It is worthless to me. The program I am using came to me from *Chromassette* to which I subscribe. If *Chrommasette* can put out an excellent program along with five or six other programs on one cassette for $5 and another firm puts out a lousy program for $17.95, who is the pirate?

If pirates can threaten the software industry how do you explain the success of the recording industry? For every computer program that has been copied there must have been thousands of records and tapes copied; however, RCA and Columbia have survived.

You mentioned the software companies that have gone out of business. Just possibly there were other factors that contributed to their demise. As you know, everyone wants an alibi.

William Auman
Bella Vista, CA

CHRISTMAS ADVENTURES

Editor:

I would like to know when or if you plan to be finished with the Adventure Book of programs from the last contest?

John D. Cleveland
Lunenburg, N.S., Canada

Editor's Note: *The Rainbow Book of Adventures*, our first book, will be available around Christmas at many stores, including your local computer store and through us directly.

INFORMATION, PLEASE

Editor:

Perhaps one of your readers can help me with a problem. I have the 16K CoCo "D" board, upgraded to 32K, two disk drives and the Okidata 82A printer.

The local Radio Shack stores ran a closeout sale of the TRS-80 Videotex Terminal (25-5001) for $99. The regular price was $399. I wanted a Modem but the price was so good, I bought the Videotex Terminal. (I think I should have spent the additional price and bought the Modem instead.)

Although the Terminal works fine, it will not allow me to make printouts, as there is no provision for signal output except to a monitor.

First, I would like to upgrade to 32K on the Videotex Terminal. I feel pretty sure that I can use the same procedure that I used in upgrading the CoCo.

Secondly, and the main reason for this letter, I am trying to find a way to feed a signal from the Videotex Terminal to the RS-232 port of my Color Computer, so that I can make use of the printer. I have the manuals and schematics of both units, and also have the Videotex program on tape. But is it needed? I have no objections to "digging into" the printed circuits *if necessary*. I sure would appreciate information from someone who might have done this. I've contacted several Radio Shack Computer Centers and they have said that it can be done, but no one has had the knowledge to tell me how.

My address is 214 Russell Avenue, 08007. Thank you.

Bill Helmetag
Barrington, NJ

Editor:

I'm interested in obtaining information with regards to updating my Color Computer version D to the current version. After studying the printouts of the 16K RAM versus the 64K RAM, it appears that it is only necessary to modify three printed circuit-board traces to upgrade the memory to 64K. In addition, it appears that it would only be necessary to make the change which allows the video pages to high order memory and to install the BASIC ROM version 1.2.

Any information you have concerning this possible modification will be greatly appreciated.

Joe. H. Apple
Walkersville, MD

Editor's Note: See B. H. Alsop's article "64K Modification for 'D' Board" in the March 1983 *Rainbow* (page 100). Be sure to cut Pin 4 instead of Pin 5 as corrected in the August issue.

HOW TO LEARN THE LANGUAGE

Editor:

I am a proud owner of a recently acquired TRS-80 32K Extended BASIC Color Computer, and am anxious to put it through its paces.

I started using BASIC shortly after Professor Kemeny first published at Dartmouth, and I find the variations in the language fascinating.

Now I would like to become acquainted with 6809 assembly language. Would you help?

Art Bridgman
Pittsfield, MA

Editor's Note: See the next letter and read assembly language columns in *Rainbow*. Good luck!

Editor:

My name is Lee Perkins, III and I'm 15 years old. I am planning to get an editor and assembler (*EDTASM+*) for my birthday. I had a chance to look at one at a nearby Radio Shack, and I found the instructions confusing.

I would like to try to make a voice synthesizer, but I don't know how to make the editor and assembler make sound. In BASIC, it's just *SOUND X,Y*, but how do you do it in assembly language? Also, do you think you could give me a few pointers on how to make assembly language programs?

L. Perkins, III
Norfolk, VA

Editor's Note: Radio Shack has a new book called "Color Computer Assembly Language Programming," Cat. No. 62-2077. Maybe this will solve your problems.

Editor:

Does anyone know why all CoCos cannot accept the high-speed, *POKE 65495,0* command? Is it a ROM-based problem? Does the fault lie within certain 6821 PIAs? Most sources of information seem to shy away from the question or ignore it completely, but the speed up is a highly attractive feature which can be very useful and all CoCos should be able to perform it. Until the problem is solved, there is a "semi-radical" (but apparently harmless) solution at hand.

Robert Brooks, in a letter published in the September 1982 issue of *80 Micro* (page 26), suggests removing capacitors C73 and C75 in order to achieve reliable operation of the CoCo in the speed-up mode. He also states that every CoCo he has converted in this manner performs properly and that he has no idea why the capacitors are there in the first place.

After reading his letter, I removed C73 and C75 from my D Board model CoCo

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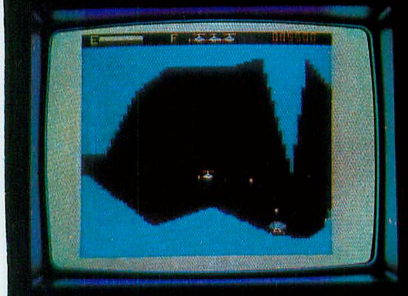

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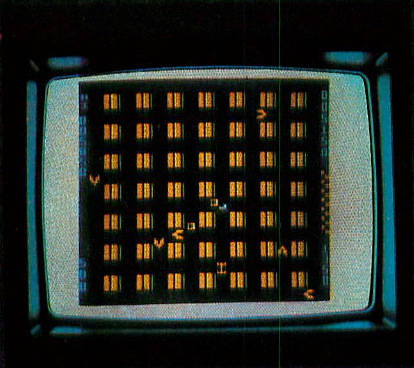

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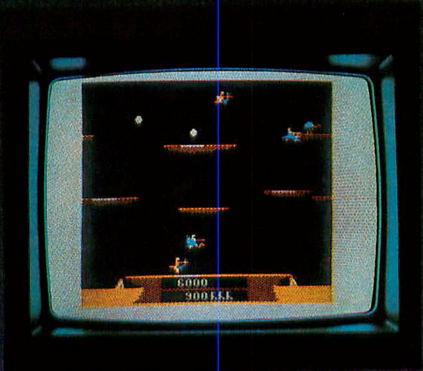

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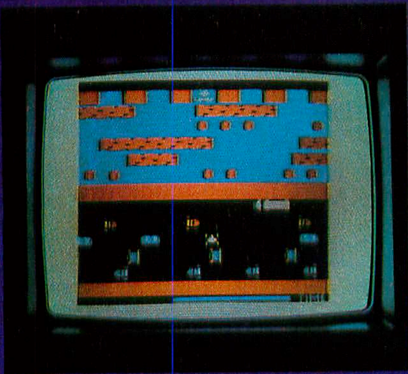

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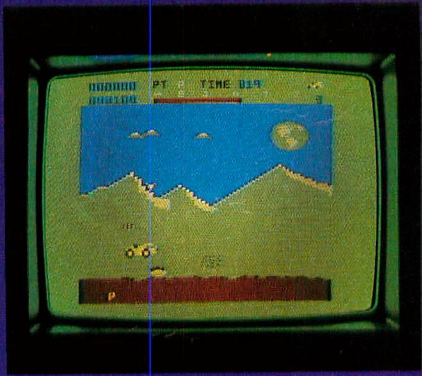

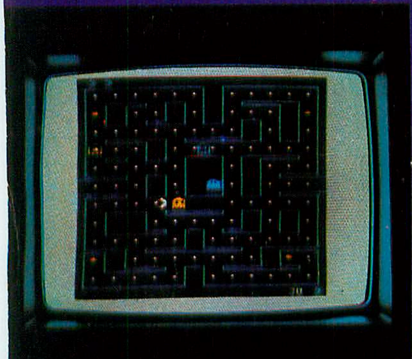

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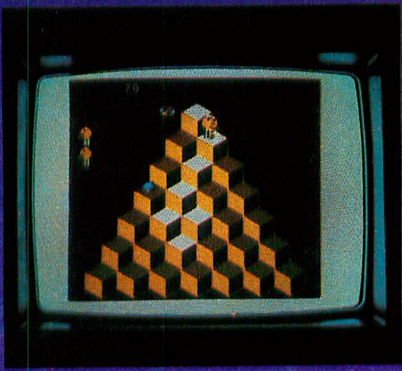

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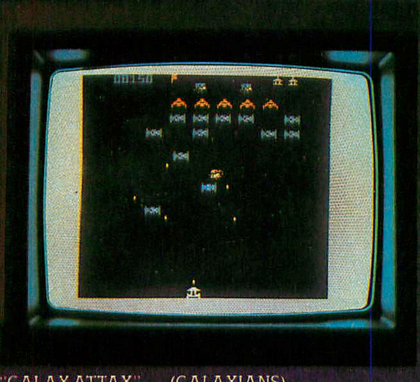

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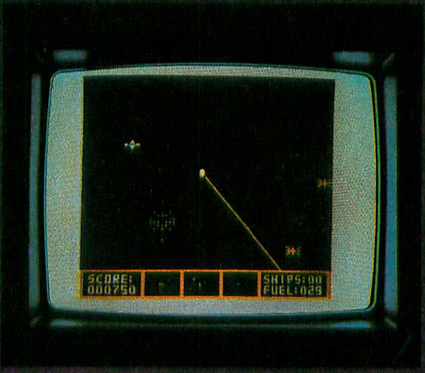

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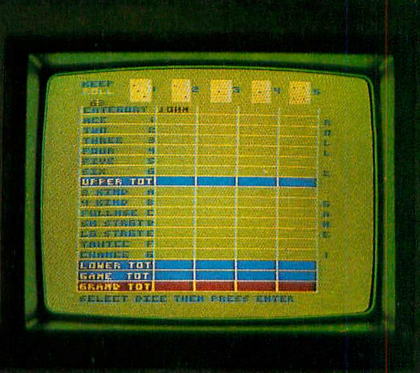

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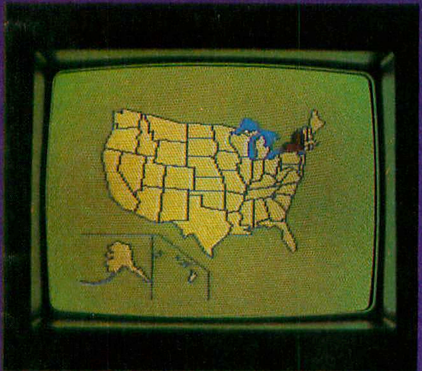

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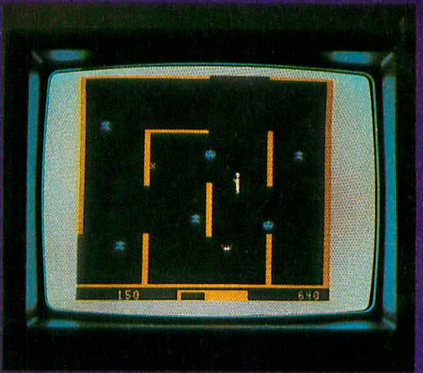

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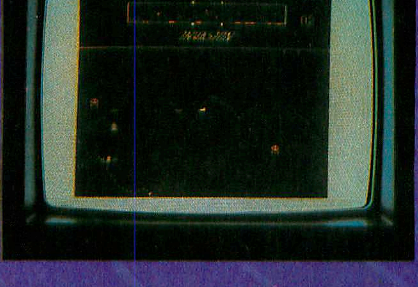

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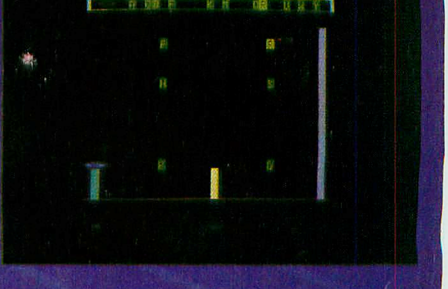

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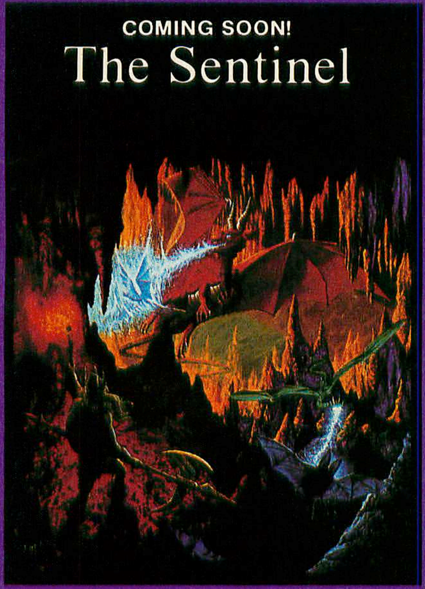

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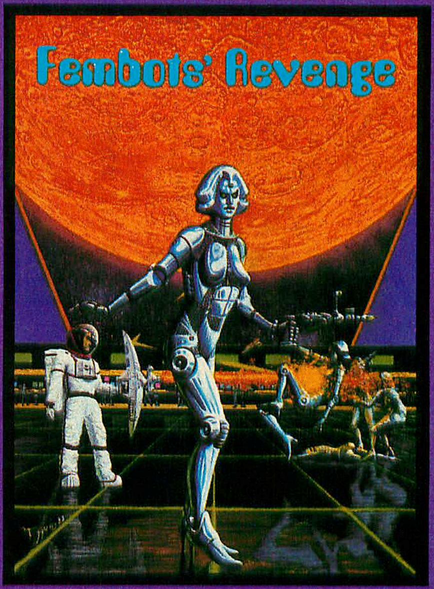

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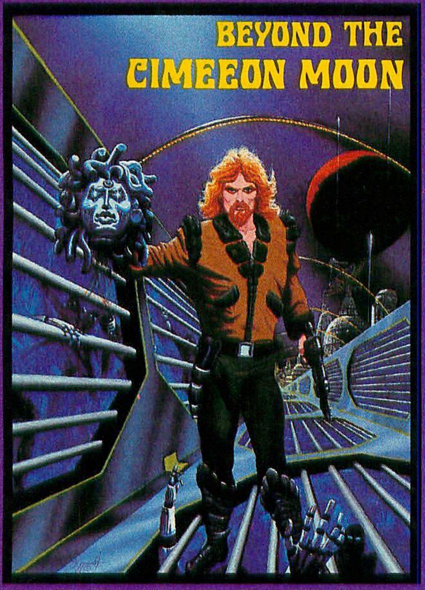

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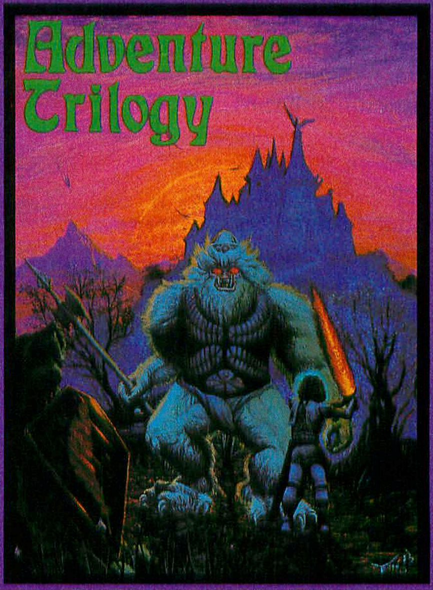

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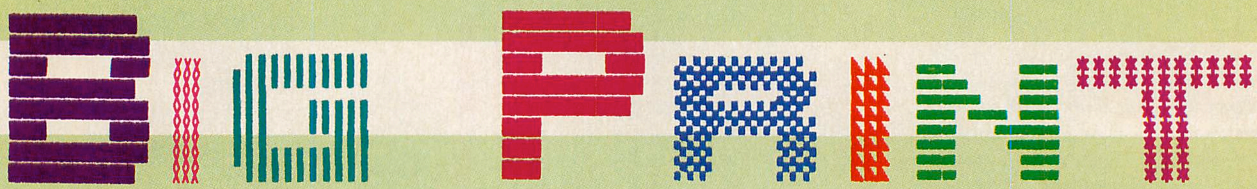

By Michael J. Himowitz

Not long after I got a new printer, I became fascinated with the idea of using it as a typesetter — with my own typefaces. I also wanted a utility that would create unusual and eye-catching title pages without a hassle. The result is *Bigprint,* which is designed for a 16K Color Computer with Extended BASIC but will run — with a few minor modifications — on any computer with similar BASIC string manipulation commands.

Bigprint creates lines of block characters in an 8″ by 11″ grid and centers them horizontally on the page. The character set includes the 26 letters of the alphabet and the numbers 0 through 9. The program will also allow the block character lines to be interspersed with lines of normal-sized type (10 CPI), which will also be centered. The block characters can be made up of any ASCII character your printer will handle.

In its default mode, designed for the LP VII and DMP-100 (which do not have condensed type), *Bigprint* will print six block characters to a line on an 80-column printer and 10-characters on a 132-column printer. If you have a printer such as the Epson or Gemini with condensed type, boldface, double-strike, block graphics and linefeed length control, *Bigprint* offers unlimited possibilities with up to 10 characters per line on an 80-column printer. With the right commands, it can even create a reasonable facsimile of 72 point headline type.

(Michael Himowitz is a Washington correspondent for the Baltimore Evening Sun and proprietor of Federal Hill Software. He uses his computer extensively and has written several programs including "CoCo Accountant." He is interested in meeting people who use their computers in journalism.)

Here's how it works:

If you have a 16K machine, enter a *PCLEAR1* command before running the program. This is not necessary with a 32K computer. When *Bigprint* boots up, you will see a menu with these three choices:

A) SET PRINTER COMMANDS
B) ENTER "BIGPRINT" MESSAGE
C) SET BLOCK CHARACTER

If you have a DMP-100 or LP VII printer, use options "B" or "C." The printer commands in "A" won't be of any help to you. If your printer will accept these commands, use "A" first if you want a typeface that is different from the default.

A) Set Printer Commands

If you have a printer with the enhancements mentioned above (some or all are available on the Epson, Gemini, C. Itoh, and Okidata, as well as on the Radio Shack DMP-200 and equivalent printers), you have a vast variety of options. There are two different sets of printer commands, one for the lines of *Bigprint* type and one for lines of standard 10-CPI type.

They will allow you to enter a string of up to 20 ASCII control and escape codes, one at a time. Each ASCII number must be followed by an [ENTER]. For those who have used the *Telewriter* word processor, the format is similar to the DIRECT command entry on the format menu.

When you're through with your command string, hit the [ENTER] key with no other input. The program will then print out the command string on the screen in the form CHR$(X) CHR$(Y), etc. It will ask if the string is correct. If it is, [ENTER] "Y" and the string will be sent directly to the printer (make sure it's on line). If it is not correct, [ENTER] "N" and you will be prompted for the entire string again.

Always make the first command(s) in the string the codes that return the printer to its normal printing state (10 CPI). This will nullify any previous commands and prevent nasty surprises. On the Epson or Gemini (which I use), the return to normal printing means entering a 27 followed by a 64. This is the equivalent of an ESC "@." Follow this with the commands you want for the actual printed line.

For example, to print in the condensed mode on the Epson or Gemini, enter a 15. This is necessary to get 10 *Bigprint* characters per line on an 80-column printer. For double strike, [ENTER] a 27 followed by a 71. To set the Gemini linefeed to 7/72 of an inch, which creates nice, dense letters with condensed type, enter a 27 and a 49. On some printers, you can use a series of codes to set linefeeds to a tiny fraction of an inch, which will give you even denser (albeit somewhat squashed) lettering. For other printers, consult your manual to determine the appropriate ASCII codes. It's a lot of fun to experiment.

B) Enter *Bigprint* Lines

When you choose this option, there will be a slight delay while the character-building strings are read into memory. Then the program will ask whether you want six or 10 characters per line. Enter the appropriate number, but remember that you need condensed type to get 10 characters per line with an 80-column printer.

Having taken care of this housekeeping, you are ready to enter the *Bigprint* text. For each line, the program will ask you to enter either "B" for a *Bigprint* line or "S" for standard sized type. Once you have done this, you may enter the line itself. You will then be prompted for the next line. The program will accept up to 10 lines of type. When you've completed your message, hit the [ENTER] key with no other input when prompted for the line type size. Your message will then be displayed line by line, along with an "S" for standard type or "B" for *Bigprint*.

To print the message, position the paper roughly according to the number of lines you have. It was impossible to program this function because the length of linefeeds will vary. You'll have to do a little estimating. Once the paper is in position, hit the [ENTER] key and watch the program hum. Experiment to get the feel of it.

C) Set *Bigprint* Character

The default character that makes up the *Bigprint* blocks is an "X." You can change this to any character your printer will accept by entering the proper ASCII code for that character. Check your printer manual for a list of codes and their respective characters. For example, if you want to change the block character to a "%,"[ENTER]37. For a "Z," [ENTER]90.

This function will also allow you to use block graphics characters if they are available on your printer. For example, to get dense, black headline-style type on my Gemini, I used the solid black full-space block ASCII (239), set the linefeed to 10/144 of an inch and used the condensed type face with double strike.

I had a lot of fun fooling around with various character combinations, and here are a few guidelines. *M*s and *W*s

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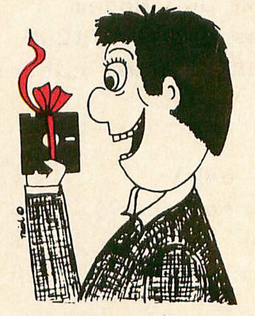

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produce darker characters, while "+" signs, slashes and *I*s produce more delicate type. You can get a very good bold effect by using an asterisk (*) with a combination double strike and emphasized mode, while some of the graphic block characters produced type that seemed to jump right off the page.

On some printers, you may run into a little problem centering in the condensed type mode. This happens because condensed type is not standardized. On my mini, it's 17 characters per inch, but other printers use 15, 16 or 18 CPI. You can alter this by changing line 530. The number 128 in that line represents the number of columns on 8½" paper in the 17-CPI mode. By adjusting this number up or down you can move the centering in the appropriate direction.

A word about conversions. If you would like to run this program on another computer, it requires only a few changes. First, change all the *PRINT#-2*, commands to *LPRINTs*. And get rid of the fancy graphics at the start by deleting Line 25 and Lines 20000 through 20360. You might want to do this on your Color Computer anyway, since they're gratuitous. I just happened to like them. Some computers may not require the CLEAR 4400 in Line 20. Also, for the block character replacement function to work, the computer's BASIC must allow the *MID$(A$,X,Y)* command to be used to replace one substring with another. Finally, the computer must accept the *STRING$* command.

127	011A
534	044E
3020	07D0
4230	0B84
11001	0FEC
20010	1366
END	1674

The listing:

```
10 REM BIGPRINT
11 REM (C) 1983 BY MICHAEL J. HI
MOWITZ
20 CLEAR 4400
25 GOSUB 20000
30 DIM G$(41), L(40,8), J$(15),
M(15), TF$(10), RW(20), RX(20)
33 BE=88
35 GOSUB 5000
40 CLS:PRINT"ONE MOMENT PLEASE..
..":FOR X=1 TO 41:READ G$(X)
45 IF BE<>88 THEN GOSUB 3000
50 NEXT X
90 FOR X=1 TO 36
100 FOR Y=1 TO 8
110 READ L(X,Y)
120 NEXT Y
125 NEXT X
126 RESTORE
127 GOSUB 1000
200 CLS:PRINT:PRINT"            b
igprint":PRINT
210 PRINT"YOU MAY INPUT UP TO 15
 LINES":PRINT"WITH UP TO"NC "LET
TERS EACH"
220 PRINT:PRINT "TO BEGIN,":INPU
T"PRESS enter";PE
230 CLS:FOR J=1 TO 15
240 PRINT "LINE NO. "J:INPUT"(s)
TANDARD OR (b)IGPRINT";TF$(J):GO
SUB 4400:IF TF$(J)="B" THEN PRIN
T" ("NC" CHRS MAX.)"
242 IF TF$(J)<>"B" AND TF$(J)<>"
S" THEN PRINT"'B' OR 'S', PLEASE
":SOUND 200,5:GOTO 240
243 LINE INPUT J$(J)
250 IF TF$(J)="B" AND LEN(J$(J))
> NC THEN SOUND 100,3:PRINT"LINE
 TOO LONG":PRINT"corrected":GOTO
 240
255 GOTO 390
260 LL=LEN(J$(J)):VB=NC-LL:VC=IN
T(VB/2)+1:J$(J)=STRING$(VC,32)+J
$(J)
390 NEXT J:GOTO 500
400 J=J-1:GOTO 500
500 CLS:PRINT"YOUR MESSAGE:":FOR
 K=1 TO J:PRINT TF$(K)+">"+J$(K)
:NEXT:PRINT:PRINT"POSITION TOP O
F PAPER":PRINT"AT PRINTER HEAD":
INPUT "AND PRESS enter";PE
520 FOR K=1 TO J
523 IF TF$(K)="S" THEN GOSUB 200
0:GOTO 650
525 FOR Y=1 TO 8
527 LL=LEN(J$(K)):TL=LEN(J$(K))*
13
530 IF NC=10 THEN TL=INT((128-TL
)/2) ELSE IF NC=6 THEN TL=INT((7
8-TL)/2)
535 PRINT#-2,STRING$(TL,32);
550 FOR V=1 TO LEN(J$(K))
555 IF MID$(J$(K),V,1)="O" THEN
MID$(J$(K),V,1)="0"
560 Z$(V)=MID$(J$(K),V,1)
561 IF V>LEN(J$(K)) THEN 640
562 M(V)=ASC(Z$(V))-64
565 IF M(V)=-32 THEN M(V)=27:GOT
O 600
570 IF M(V)<-6 AND M(V)>-16 THEN
 M(V)=M(V)+43
600 PRINT#-2,G$(L(M(V),Y))+"   ";
610 NEXT V
620 PRINT#-2
630 NEXT Y
640 PRINT#-2:PRINT#-2
650 NEXT K
660 GOTO 5000
1000 CLS:PRINT:PRINT"           b
igprint":PRINT
1010 PRINT"HOW MANY CHARACTERS P
ER LINE?"
1020 PRINT:PRINT"6 CHARACTERS (S
TANDARD 10 CPI)":PRINT"10 CHARAC
TERS (NEEDS CONDENSED":PRINT"FON
T OR 132-COL PRINTER)":PRINT:INP
UT"YOUR CHOICE (6 OR 10)?";NC
1040 IF NC<>6 AND NC<>10 THEN 10
```

```
00
1080 RETURN
2000 IF TF$(K-1)="S" THEN PRINT#
-2
2010 IF TF$(K-1)="B" THEN FOR U=
1 TO 2:PRINT#-2:NEXT U
2020 LL=LEN(J$(K))
2030 TL=INT((76-LL)/2)
2045 FOR E=1 TO NP-1:PRINT#-2,CH
R$(RX(E));:NEXT E:PRINT#-2,STRIN
G$(TL,32)+J$(K)
2050 IF TF$(K+1)="S" THEN PRINT#
-2
2060 IF TF$(K+1)="B" THEN FOR D=
1 TO CM-1:PRINT#-2,CHR$(RW(D));:
NEXT D:FOR U=1 TO 3:PRINT#-2:NEX
T U
2070 RETURN
3000 FOR U=1 TO LEN(G$(X))
3010 IF MID$(G$(X),U,1)="X" THEN
 MID$(G$(X),U,1)=CHR$(BE)
3020 NEXT U:RETURN
4000 CLS:PRINT"YOU MAY ENTER UP
TO 20 DIRECT    PRINTER COMMANDS.
 THEY SHOULD    BE IN THE FORM OF
 ASCII CONTROL  OR ESCAPE CODES.
TO END THE      STRING OF COMMAND
S, HIT enter    WITH NO OTHER INP
UT."
4010 PRINT"DO YOU WANT TO ENTER
THESE":INPUT"PRINTER COMMANDS (Y
/N)";PC$
4020 IF PC$<>"Y" THEN 5000
4030 CLS:CM=1
4040 PRINT"COMMAND NO. "+STR$(CM
)+":";:INPUT RW(CM):IF RW(CM)=0
THEN 4100
4050 CM=CM+1
4060 GOTO 4040
4100 CLS:PRINT"HERE IS THE STRIN
G OF COMMANDS  YOU HAVE JUST ENT
ERED":PRINT
4110 FOR D=1 TO CM-1:PRINT"CHR$(
"+STR$(RW(D))+") ";:NEXT D
4120 PRINT:INPUT "IS THIS CORREC
T (Y/N)";CR$:IF CR$<>"Y" THEN PR
INT "corrected": GOTO 4030
4130 FOR D=1 TO CM-1:PRINT#-2,CH
R$(RW(D));:NEXT D:PRINT#-2
4140 CLS:PRINT"INPUT THE COMMAND
S THAT RESTORE ";:PRINT"NORMAL P
RINTING.":PRINT"HIT enter WHEN F
INISHED"
4150 NP=1
4160 PRINT"COMMAND NO."NP":";:IN
PUT RX(NP):IF RX(NP)=0 THEN 4200
4170 NP=NP+1:GOTO 4160
4200 CLS:PRINT"THESE ARE THE COM
MANDS TO         RESTORE NORMAL PR
INTING"
4210 FOR E=1 TO NP-1:PRINT"CHR$(
"RX(E)")";:NEXT E
4220 PRINT:INPUT "IS THIS CORREC
T (Y/N)";CR$:IF CR$="Y" THEN 500
0
4230 PRINT"corrected":GOTO 4150
4300 CLS:PRINT"THE DEFAULT CHARA
CTER FOR        LETTER BLOCKS IS
'X', WHICH IS   ASCII (88). DO YO
U WISH TO       SUBSTITUTE ANOTHE
R CHARACTER?    (Y/N)?"
4310 INPUT YD$:IF YD$<>"Y" THEN
BE=88:GOTO 4330
4320 INPUT"ENTER THE ASCII CODE
FOR THE      CHARACTER YOU WANT";B
E
4330 GOTO 5000
4400 IF TF$(J)="" THEN 400 ELSE
RETURN
5000 CLS:PRINT"            BIGPRIN
T":PRINT"
5010 PRINT"A. SET PRINTER COMMAN
DS":PRINT"B. ENTER 'BIGPRINT' ME
SSAGE":PRINT"C. SET BLOCK CHARAC
TER"
5020 CH$=INKEY$:IF CH$="" THEN 5
020
5030 ON INSTR("ABC",CH$) GOTO 50
60, 40, 4300
5040 GOTO 5000
```

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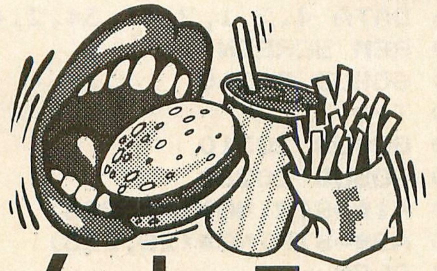

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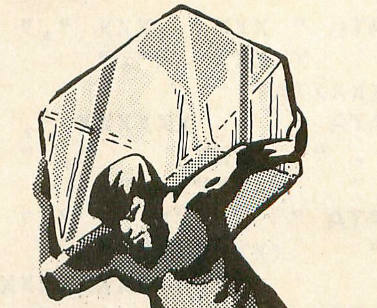

ICEMASTER

RAINBOW CERTIFICATION SEAL

Push blocks of ice to crush giant mosquitos and avoid getting stung long enough to get them all. *Three levels with graphics so real you'll want your fly swatter.* Don't miss this arcade classic.

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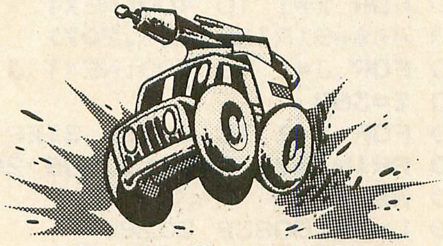

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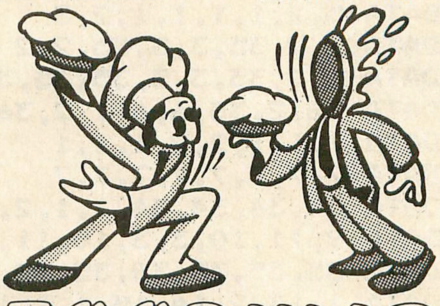

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RAINBOW CERTIFICATION SEAL

You are in a foodfight against the evil chefs. Can you eat the icecream cone before it melts? Fast paced arcade action and sound make this game unforgettable. *Fifteen screens and ten levels of play.*

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```
5060 GOSUB 4000:GOTO 5000
10001 DATA "XXX     XXX",XXXXXXX
XXXX,"XXXXXXX    "," XXXXXXXXX "
,"XXXXXXXXXX "
10006 DATA XXX   XXXXX,"    XXX
   ",XXX  XX XXX,"XXX    XXX ","
XXX  XXX   "
10011 DATA "XXX   XXX  ",XXX
XXXX,XXXX   XXXX,XXX XXX XXX,XXX
  X  XXX
10016 DATA XXXX    XXX,XXXXX   X
XX,XXX    XXXX,XXX   XXXXX," XXX
XXXX  X"
10021 DATA " XXX   XXX ","  XXX
XXX  ","   XXXXX   ","     X
 ","  XXXXXXX  "
10026 DATA "     XXXXXX ", "  XX
XX     ", "   XXX      ", " XXXX
     ", "    XXXX    "
10031 DATA "  XXXXX    ","     XX
XXXX ","     XXXXXXX","      XX
X","XXX       "," XXXXXXXXXX"
10036 DATA "           ", "  X
XXX    ", "XXXXXXXXX  "," XXXXX
    ", " XXXXXXXXXX"
11001 DATA 4,2,1,1,2,2,1,1
11002 DATA 5,2,1,5,2,1,2,5
11003 DATA 4,2,35,35,35,35,2,4
11004 DATA 5,2,1,1,1,1,2,5
11005 DATA 2,2,35,3,3,35,2,2
11006 DATA 2,2,35,3,3,35,35,35
11007 DATA 36,2,35,6,6,1,2,36
11008 DATA 1,1,1,2,2,1,1,1
11009 DATA 7,7,7,7,7,7,7,7
11010 DATA 34,34,34,34,1,1,2,4
11011 DATA 9,11,10,3,3,10,11,12
11012 DATA 35,35,35,35,35,35,2,2
11013 DATA 1,13,2,14,15,1,1,1
11014 DATA 1,16,17,14,19,18,1,1
11015 DATA 4,2,1,1,1,1,2,4
11016 DATA 5,2,1,2,5,35,35,35
11017 DATA 4,2,1,1,8,1,5,20
11018 DATA 5,2,1,5,2,1,1,1
11019 DATA 36,2,35,5,36,34,2,5
11020 DATA 2,2,7,7,7,7,7,7
11021 DATA 1,1,1,1,1,1,2,4
11022 DATA 1,1,1,21,22,23,7,24
11023 DATA 1,1,1,15,14,2,1,1
11024 DATA 1,1,21,23,25,21,1,1
11025 DATA 1,21,22,23,7,7,7,7
11026 DATA 2,2,32,30,27,29,2,2
11027 DATA 37,37,37,37,37,37,37,
37
11028 DATA 38,40,7,7,7,7,7,7
11029 DATA 5,2,34,4,39,35,2,2
11030 DATA 5,2,34,32,33,34,2,5
11031 DATA 1,1,1,2,2,34,34,34
11032 DATA 2,2,35,5,2,34,2,5
11033 DATA 35,35,35,5,2,1,2,4
11034 DATA 2,2,34,34,34,34,34,34
11035 DATA 4,2,1,4,2,1,2,4
11036 DATA 4,2,1,2,41,34,2,4
20000 REM SCREEN
20010 GOSUB 20260
20020 T=0
20030 GOSUB 20310
20040 GOSUB 20260
20050 A1$=STRING$(30,223)
20060 A2$=STRING$(28,223)
20070 CLS0
20080 PRINT@481,A1$;:PRINT@481-3
1,A2$;
20090 PRINT@418,STRING$(28,211);
20100 A3$=CHR$(223)+STRING$(26,2
20)+CHR$(223)
20110 PRINT@386,A3$;
20120 FOR X=1 TO 400:NEXT
20130 A4$=STRING$(24,207)
20140 FOR J=1 TO 500:NEXT J
20150 Z=388
20160 FOR Y=Z TO Z-388 STEP -32
20170 PRINT@Y, A4$;:GOSUB 20290
20180 NEXT Y
20190 L=75:GOSUB 20280
20200 FOR J=1 TO 150:NEXT J
20210 P$=C$:L=134:GOSUB 20280
20230 P$=H$:L=266:GOSUB 20280
20240 P$=BG$:L=331:GOSUB 20280
20250 IF INKEY$="" THEN 20250
20251 RETURN
20255 GOTO 23
20260 P$="bigprint"
20270 RETURN
20280 FOR K=1 TO LEN(P$):PRINT@L
,LEFT$(P$,K);:GOSUB 20290:FOR X=
1 TO 20:NEXT X:NEXT K:RETURN
20290 PLAY "V15;T255;L8;C;B;A;G;
D"
20300 RETURN
20310 M2$=STRING$(5,207)+P$+STRI
NG$(8,207)
20320 C$="by"+CHR$(128)+"michael
"+CHR$(128)+"himowitz"
20340 H$="hit"+CHR$(207)+"any"+C
HR$(207)+"key"
20350 BG$="to"+CHR$(207)+"begin"
20360 RETURN
```

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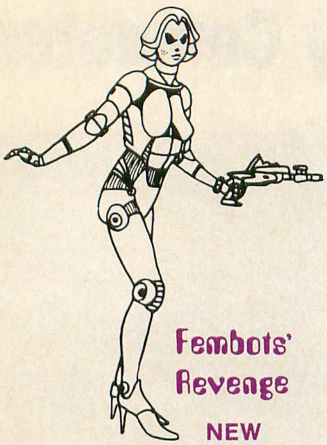

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Shooting aliens on a flat screen is nothing like BEING THERE. In machine-code 3-D excitement, highest resolution graphics and sound, you are face to face with the Guardians: the ubiquitous Fembots, the powerful Arthroks and the omnipotent Optikon. Your lasgun blasting, you hear the explosion and the crunching metal; you feel the tension as you stalk your enemy, searching for the Destruct Button on your way to the Master Bay of the Mother Ship. Can you find the means to teleport to safety?

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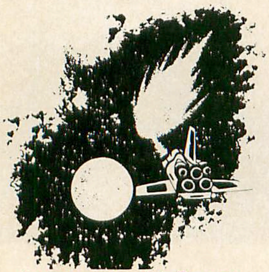

KOMET-KAZE

Another arcade hit! The Asteroid Belt is crashing down on Earth. You are the first-line defense. You must destroy the blazing asteroids and the homing orbs with your disruptor. Machine-code speed, multi-colors on a black background - the crash and explosions of the asteroids rain on your senses!

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THE SENTINEL

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A dark, awful secret is hidden in the cavernous labyrinth. Beyond the chasms, the poisonous gasses, Tunnels of No Return and the relentless minions, the Sentinel hungrily awaits! Sorcerous magick and saintly swordplay are your best friends and worst enemies. You are no ordinary warrior in this ultra hi-res, 3-D medieval adventure! Can you survive to discover the secret - or is there a seat in the netherworld for you too?

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Xygoid

NEW

Your ship is being enshrouded by the Xygoid Web. Certain death is minutes away! You must blast through the enveloping Web and destroy the Xygoid vessel before you are crushed. This is a multi-colored machine-code game in the highest resolution mode on a black background. Xygoid, from the galactic beginning! It will ensnare your mind!

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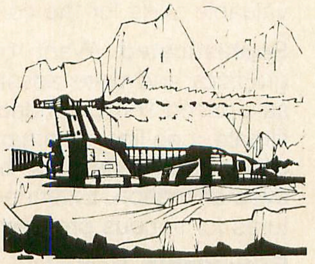

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NEW ARCADE GAME

Fyr-Draca (Fire Dragons), from egg to the daemonic behemoth, greet you in five waves with nine colors on the screen at one time! This machine code game is going to sweep the Color Computer market. It is by far, the best game to come out for a long, long time. The real arcade look is here at last!

Fire Dragons uses the nine color mode to create a screen of dazzling color with a black background and a black border. Dragons swoop from their stellar watch, singly, in groups and in squadron formation. First you face the single wyrms, then the squadron, next the twin giants, followed by the Battle Drake and its minions. Even with four star vessels and shields you will be hard put to survive their spitting fire and diving attacks!

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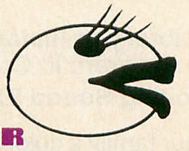

MS. NIBBLER

Ms. Nibbler is not just another pretty face with glossy red lips. She's a feisty lady, who moodily prowls her black maze. This game has the real arcade action and the real arcade look too! Your joystick will almost burn out as you try to keep up!

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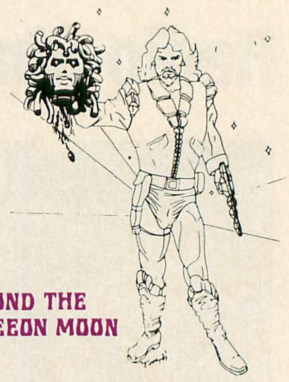

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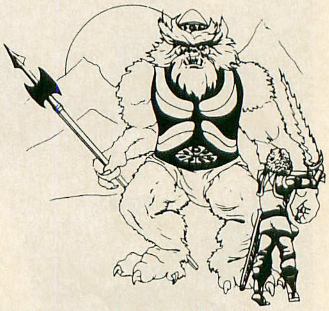

Adventure Trilogy

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Clash steel with thy foe in the arena of gore. Proved worthy, go in quest of the elusive Eye of Dazmor. If ye findest the orb, hast ye the might to ward off skem and the fortitude to restore the Eye? The ultimate high-res, 3-D quest for even the most experienced adventurer!

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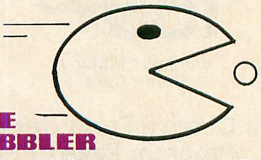

THE NIBBLER

The King of Pac games is here. This fast-paced maze-chase game will challenge the most skilled. You guide The Nibbler through the maze, the portals, onward to the Energy Pills. Then the Ghouls, constantly at your heels, will end up in your belly! The better you get the better you have to become to master the blazing speed. You haven't pushed your skill until you've tried this one!

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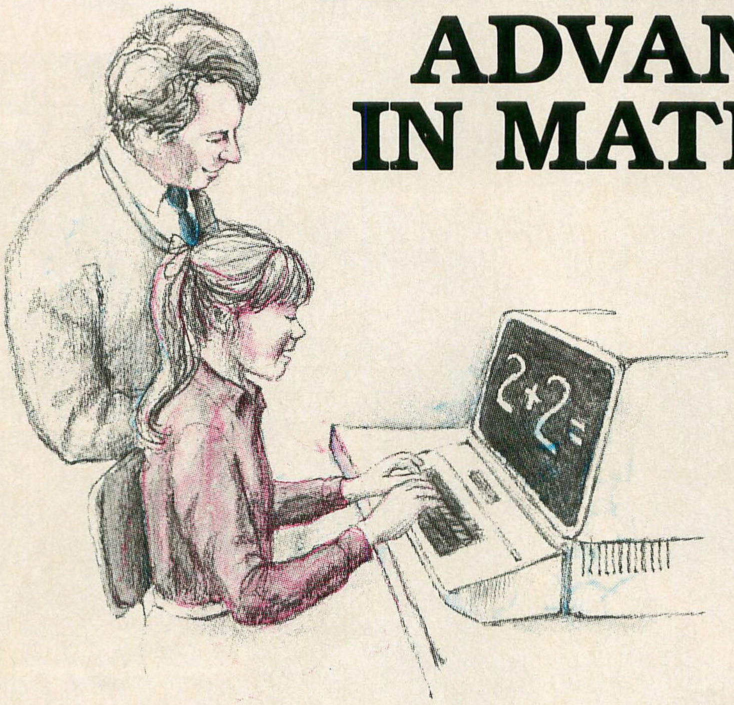

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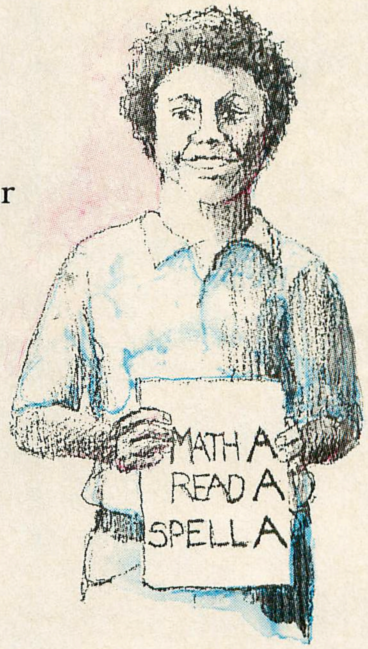

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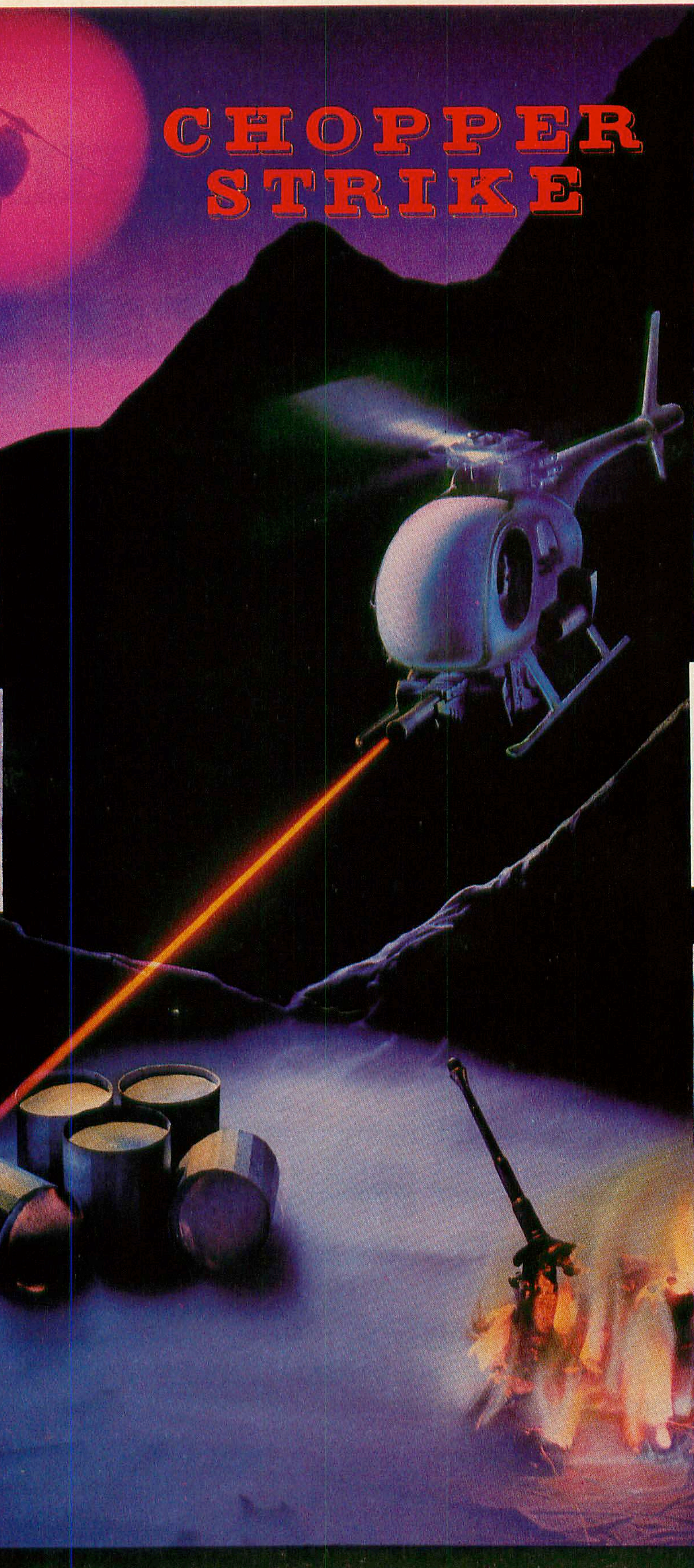

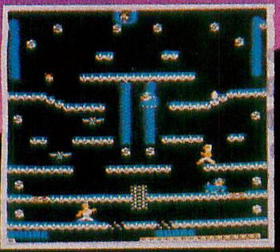

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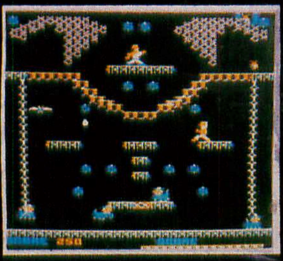

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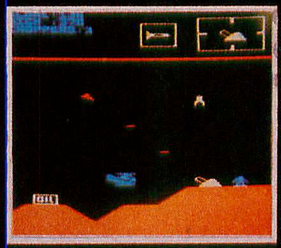

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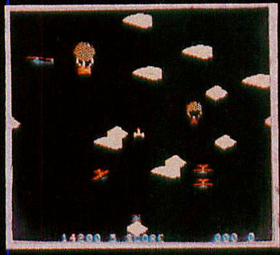

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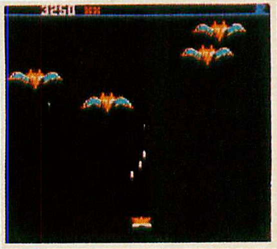

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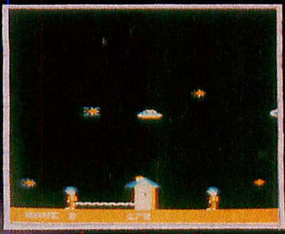

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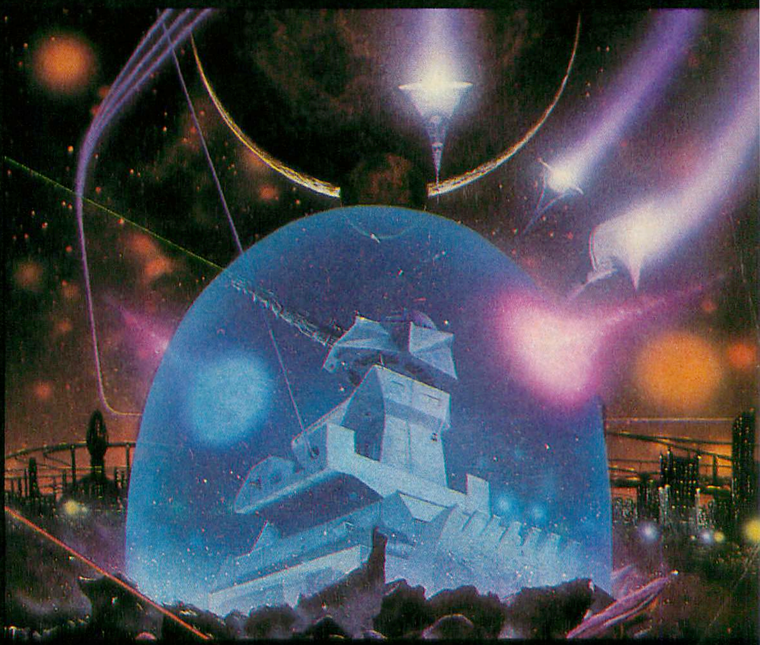

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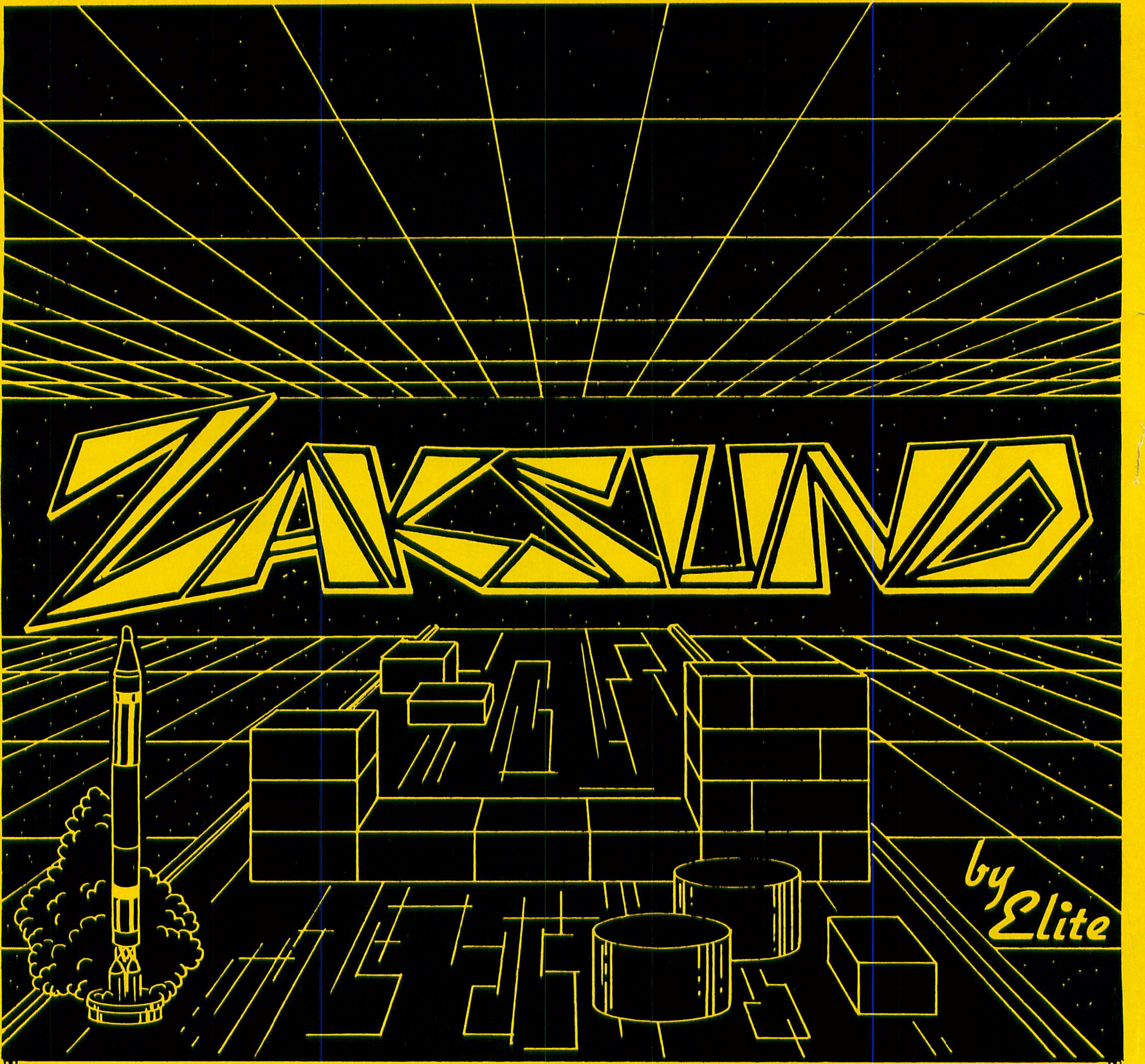

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32K
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LANGUAGE

A Little Tree-Trimming Music

By David Banaszak

Here's a jolly program sent to us by David Banaszak of New Carlisle, Ohio to get you and your family in the holiday spirit. Requiring 16K Extended Color BASIC, *Christmas Carols* provides eight holiday favorites that you or your CoCo can select.

To "spruce up" *Christmas Carols,* David added a star and a Christmas tree found in Radio Shack's "Going Ahead With Extended Color BASIC." One helpful hint: If you wish to add more songs, just edit Lines 38, 39, 40 and 41, and insert more options in the menu Lines 24, 33. Song subroutines can then be added as desired. So, trim the tree, drink some eggnog and sing along with CoCo.

		400	0691
30	0170	600	09D8
100	02EC	2010	0CB3
230	0478	END	0E8B

The Listing:

```
1 XX=RND(-TIMER)
2 CLS:PRINT"DAVID BANASZAK"
3 PRINT"168 STRATMORE"
4 PRINT"NEW CARLISLE,OH45344"
5 FORI=0TO500:NEXT
10 CLS
```

(David Banaszak is an engineer at the Air Force Wright Aeronautical Laboratories at Wright Patterson AFG, Ohio. He, his wife, Pat and four children have used the CoCo for music, budgeting, mailing labels, and of course, games and learning.)

```
20 PRINT@1,"SELECT A TUNE"
21 PRINT@17,"MEM LEFT=";MEM
24 PRINT@32,"0-RANDOM ORDER"
25 PRINT@64,"1-DECK THE HALL"
27 PRINT@96,"2-GOOD CHRISTIAN":P
RINT@130,"MEN REJOICE"
28 PRINT@160,"3-JOY TO THE":PRIN
T@194,"WORLD"
29 PRINT@224,"4-JINGLE BELLS"
30 PRINT@256,"5-12DAYS OF":PRINT
@290,"CHRISTMAS"
31 PRINT@320,"6-SILENT NIGHT"
32 PRINT@352,"7-O COME ALL YE ":
PRINT@386,"FAITHFUL"
33 PRINT@416,"8-GOD REST YE MERR
Y":PRINT@450,"GENTLEMEN"
34 INPUT M:KK=RND(5):'KK=PICTURE
#
35 CLS:PRINT@64,STRING$(32,"*"):
PRINT@352,STRING$(32,"*")
38 IF M=0THEN M=RND(8):N=9
39 IF M<1ORM>8THEN10
40 GOSUB2000:ON M GOSUB 100,200,
300,400,500,600,700,800
41 IFN=9 THEN M=RND(8):CLS:KK=RN
D(5):GOTO40
50 GOTO10:'SELECT PICTURE OR RAN
DOM
```

```
100 PRINT@199,"DECK THE HALL"
110 FORI=1TO2
120 A$="O4L4.CO3L8B-L4AGFGAF"
130 B$="L8GAB-GL4.AL8GL4FEL2F"
140 C$="L4.GL8AL4B-L4GL4.AL8B-O4
L4CO3G"
150 D$="L8ABO4L4CL8DEL4FEDL2C"
160 X$="XA$;XB$;":Y$="XC$;XD$;"
170 PLAY X$:PLAYX$:PLAY Y$: PLAY
 X$
180 D$="L8ABO4L4CL8DEL4FEDL2C"
190 NEXT I
199 RETURN
200 SCREEN1,1
210 FOR I=1TO2
220 A$="L8FL4FL8FL4AL8B-O4L4CL8D
L4CL8CO3L4FL8FL4AL8B-O4L4CL8DL4C
P8"
230 B$="O4L4CL8DL4CO3L8B-L4AL8GL
4.FV18L2.FV21FV15L4GL8GL4AL8G"
240 C$="L4FL8GL4AP8L4CL8DL4CO3L8
B-L4AL8GL4FL8FL4GL8GL4AL8G"
250 D$="L4FL8GL4AP8DL8DL4EL8EL4.
FO4CO3L4AL8AL4GL8GL4.FP4"
260 X$="XA$;XB$;":Y$="XC$;XD$;"
270 PLAY X$:PLAY Y$
290 NEXTI
299 RETURN
300 PRINT@199,"JOY TO THE WORLD"
310 A$="O3L2CL4O2BL8AL2.GL4FL2ED
"
320 B$="L2.CP32L4GL2GL2AL4P32AL2
.BP32L4BO3L1.C"
330 C$="L4CCO2L4BAGL4.GL8FL4EO3C
"
340 D$="O3L4CO2BAGP32L4.GL8FL4EP
32EP32EP32EP32EP32L8EF"
350 E$="L2.GL8FEL4DP32DP32DP32L8
DEL2.FL8ED"
355 F$="O2L4CO3L2CO2L4AL4.GL8FL4
EFL2EDL1C"
370 PLAY A$:PLAYB$:PLAYC$:PLAYD$
:PLAYE$:PLAYF$
399 SCREEN 0,0:RETURN
400 PRINT@199,"JINGLE BELLS":SCR
EEN 1,1
410 A$="L4CAGFL2CP4L8CCL4CAGFL2.
DP4L4DB-AGL2.EP4O4L4CCO3B-GL2.AP
4":PLAYA$
420 B$="L4CAGFL2.CP4L4CAGFL2DP4L
4DDB-AGO4CCCCDCO3B-GL2.FP4":PLAY
B$
430 C$="L4AAL2AL4AAL2AL4AO4CO3L4
.FL8GL2.AP4L4B-B-L4.B-L8B-L4B-AA
L8AA":D$="L4AGGAL2GO4CO3":E$="O4
L4CCO3B-GL2.FP4"
440 X$="XC$;XD$;XC$;XE$;"
450 PLAY X$
499 RETURN
500 SCREEN 1,0
510 A$="L8CCL4CL8FFL4FL8EFGAB-GL
4.A":B$="L8B-O4L4CL8DO3B-AFL4GL2
FL8FP4":PLAYA$:PLAYB$
520 C$="L8CCL4CL8FFFL4FL8EFGAB-G
L2":D$="O4L4CO3L8GAL4B-L8A":E$="
L8B-O4L4CL8DO3B-AFL4GL2L2.F":X$=
C$+D$+E$:PLAYX$
521 E$="L8B-O4L4CL8DO3B-AFL4GL2F
L8FP8"
525 F$="L8CCL4CL8FFL4FL8EFGAB-GL
2A":G$="O4L4CO3L8GAB-":X$=F$+G$+
D$+E$:PLAYX$
527 X$=F$+G$+G$+D$+E$:PLAYX$
530 E$="O4L2CL8DO3L4.BO4L2.CP4L8
CO3B-AGL4FB-DFL8GFEDL4CL8AB-O4L4
CL8DO3B-AFL4GL2FL8FP8"
531 X$=F$+E$:PLAY X$
539 D$="O4L4CO3L8GAB-G"
540 X$=F$
541 FOR I=6TO12
542 X$=X$+D$
543 Y$=X$+E$:PLAY Y$
545 NEXT I
599 SCREEN 0,0:RETURN
600 SCREEN1,0
605 FOR I=1TO3
610 A$="L8.GL16AL8.GL4.E"
620 B$="O4L4DL8DO3L4.BO4L4CL8CO3
L4.G"
```

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```
630 C$="L4AL8AO4L8.CO3L16BL8AL8.
GL16AL8GL4EP8"
640 D$="O4L4DL8DL8.FL16DO3L8BO4L
4.CL4EP8L8.CO3L16GL8EL8.GL16FL8D
L4.CL4CP8"
650 X$="T1XA$;XA$;XB$;XC$;XC$;XD
$;T2"
660 PLAYX$
690 NEXTI:RETURN
700 SCREEN1,0
710 A$="L4GL2GL4DGL2ADL4BABO4CO3
L2BL4AGL2GL4F+EF+GABL2F+L4.EL8DL
2.DP4"
720 B$="O4L2DL4CO3BO4L2CO3BL4ABG
AL2F+L4D"
730 C$="P4L4GGF+GAL2GL4DBBABO4CO
3L2BL4ABO4CO3BAGL2F+L4GO4CO3L2BL
4.AL8GL2.G"
750 X$="XA$;XB$;XC$;"
755 FORI=1TO3:PLAYX$:NEXT
790 RETURN
800 SCREEN1,0
810 A$="L4EEBBAGF+EDEF+GAL2.B"
820 B$="P4L4BO4CO3ABO4CDEO3BAGEF
+GL2A"
830 C$="L4GAL2BO4L4CO3BBAGF+L2EL
8GF+L4EL2AL4GABO4CDEO3BAGF+L2.E"
850 X$=A$+A$+B$+C$
860 FORI=1TO2:PLAYX$:NEXT:RETURN
2000 ON KK GOSUB 2010,3000,2010,
2010,2010
2005 RETURN
2010 PMODE 3,1
2015 PCLS
2020 C=1:D=RND(3)+1
2050 PCLS 4:SCREEN 1,0:COLOR C,D
'RS PROG#1,PAGE EXTENDED MANUAL
2220 LINE(90,96)-(118,26),PSET
2225 LINE(146,96)-(118,26),PSET:
LINE(90,96)-(146,96),PSET
2235 DRAW"BM112,96D15R10U15"
2240 LINE(0,112)-(255,96),PSET:P
AINT(128,85),1,1
2247 FOR I=1TO100
2250 X=RND(255):Y=RND(115):A=RND
(4)
2265 PSET(X,Y,A):NEXT
2266 CIRCLE(118,22),A,4
2300 RETURN
3000 PMODE4,1
3005 'REFEXTCOLORMANUAL-#7-1PG15
6
3010 PCLS:SCREEN1,0
3020 DRAW"BM68,116E20BE20E20F20B
F20F20L40BL40L40BU40R40BR40R40G2
0BG20G20H20BH20H20BM128,96NU40ND
40NE20NF20NG20NH20NL40R40"
3040 RETURN
```

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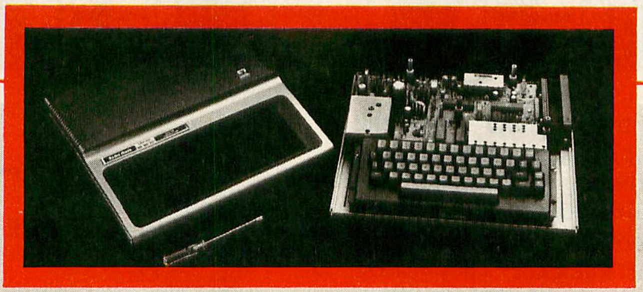

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FLAUNT YOUR COCO WITH SEASON'S GREETINGS CARDS

BY JOSEPH KOLAR

The purpose of this program is twofold. First, the object is to create either a Christmas or Easter greeting card. The second is to flaunt our CoCo in the faces of our friends, relatives and acquaintances.

Too often, when we prattle on about "my" CoCo, we must contend with a wary and skeptical audience. They realize they are in for a sustained one-way conversation, extolling the awesome power of the Color Computer. All they can hope for is to nod sagaciously and head for the nearest exit at the first opportunity. You are left standing, feeling inadequate, suspecting that you haven't gotten your message across.

The same scene reoccurs when we give a demonstration of the capabilities of the CoCo.

If you haven't heard this one, you haven't demonstrated your CoCo to a friend or relative who is unfamiliar or uneasy in the presence of a computer. "But, what else can it do?" I hate that question!

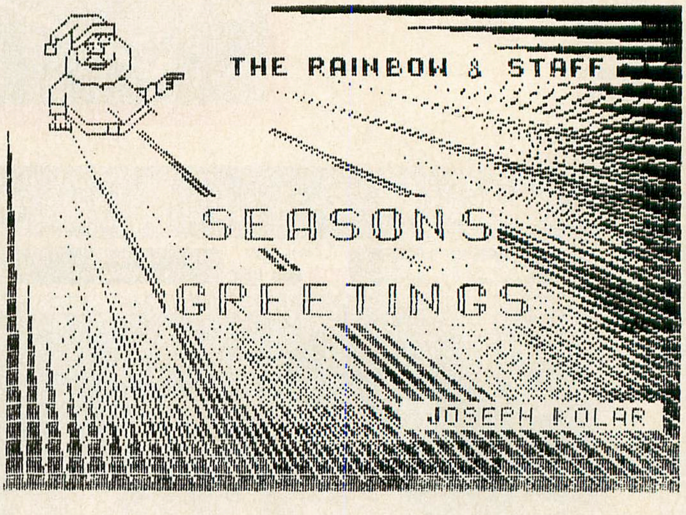
We have an opportunity to be diabolic. With the advent of the Christmas season, we can create, print and send personalized greeting cards to all, and I mean all, of our friends and relatives.

Outside of being a greeting card which can be displayed with all the store-bought cards, it will proclaim a silent message. To wit: "This is an example of what I can create on the CoCo." In some households it will become a conversation piece. I can't think of a more subtle way to proselytize for the CoCo.

To work! This program has no menu. "Mask" will mean to place a *REM* marker in front of an option program line. "Unmask" will mean to delete the *REM* marker at the beginning of an option program line.

We will mask certain program lines to delete them from the program. We will unmask a program line to use a particular option.

Figure 1



There are two backgrounds. Mask Line 45 and you will select the "shining light" background that is suited for either the pigeon or Santa. If you unmask Line 45, you will get a small cross on a circle background. Use this option if you would rather use the addressee's name only.

The areas that will have pictures of printed matter superimposed on the background must be blanked out.

To print "SEASON'S GREETINGS," unmask program Lines 137 and 138 to blank out the background. Unmask Lines 190 and 191 to print "SEASON'S GREETINGS." Use this to create Figure 1.

To print "MERRY CHRISTMAS AND A HAPPY NEW YEAR," unmask Lines 135, 136, 140 and 141 to blank out the background. Unmask Lines 145, 150, 170, 180, and 181 to print "MERRY CHRISTMAS AND A HAPPY NEW YEAR." This format is not demonstrated. The challenge is that if you can create this card you will know you understand this technique.

(Joseph Kolar is a free-lance writer and programmer dedicated to proselytizing for computers in general, and the CoCo specifically.)

To print "HAPPY EASTER," unmask Lines 137 and 138 to blank out the background. Unmask Lines 192 and 193 to print "HAPPY EASTER."

All the options are Lines 45 and the lines in the program listing from 134 to 193. Look at the listings to verify what each line does. Naturally, lines not used in your desired creation must be masked with the *REM* marker so they will not be part of the card.

Because the addressee's name or names and the signature name or names are variable in width, it will be necessary to locate and adjust the width of the blanked out background for both.

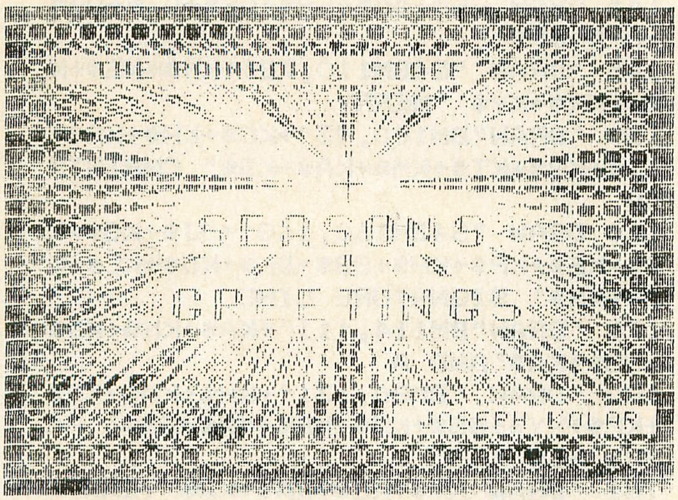
Unmasking program Line 134 blanks out the addressee's line. Unmasking program Lines 143 and 144 print the addressee's name. If the name is short, Line 144 may not be needed. Mask it if you don't need it.

Unmask Line 142 and it will blank out the signature line. Unmask Line 160 and 161 to print the signature. Again, if the name is short you may not require Line 161 and by now, you know what to do.

This is the most difficult part of the program — adjusting and locating the name/names.

There are two alphabets that you may use, a regular and fancy alphabet. The regular alphabet has a "K" as the first letter of the two-letter variable. The fancy alphabet uses a "D" as the first letter of the variable. The second letter of the variable is the literal name of the character. Numerals and some punctuation are included. See the listing for the proper variables. Each variable must have "$" as the third and final element. SS$ is the variable to use with either alphabet to space between words or names. AA$ is the ampersand, if you prefer to use it rather than "AND" in either alphabet.

Figure 2



You need not key in the numerals in the listing, if you do not expect to use them.

Both the addressee and signature lines may be printed using either of the two alphabets. You may want to use a fancy alphabet letter to indicate a capital letter and regular letters to indicate small letters. (See program Line 160.)

The names are printed using concatenation. In *DRAW* statements (see Line 160), use S4 for the size. Locate it horizontally and vertically. Do not change any vertical locations in any line. Then, print a fancy "J," DJ$; a regular "O," KO$; etc. Note SS$ separates the two names of the signature.

Remember to concatenate each letter you print by prefixing a + in front of each variable.

To locate the addressee and signature lines, we will concentrate our explanation on the addressee line.

To locate, move, widen or close in the left or right sides of the blank out for the addressee (Line 134), manipulate only the two horizontal components. To print the name/names, manipulate the horizontal component of the *DRAW* statement (Line 143). Line 144 is a continuation line and does not require any locating elements.

This operation must be done by trial and error. After all, each addressee's name or names will be different in length. Let us address the card to "THE RAINBOW & STAFF." We must expand the width of the blanked out area from horizontal 70 to horizontal 200.

```
134   LINE(70,20)-(200,30),PRESET,BF
```

This gives us a working area to make a trial printing.

Program Line 143 must begin after 70 to leave a space on the left side. Key in Line 143.

```
143   DRAW
"S4C0BM70,28"+KT$+KH$+KE$+SS$+KR$+KA$+KI$
  +KN$+KB$+KO$+KW$
```

If you continue concatenating, you will soon get an L/S error message. In that case, lop off the last variable and *RUN*. If it is okay, begin a new *DRAW* program line without the info between the quote marks and continue with the next letter.

```
144   DRAWSS$+AA$+SS$+KS$+KT$+KA$+KF$+KF$
```

Remember, (space), (ampersand), (space), etc. When this is *RUN*, the "STAFF" runs on top of the background. We must widen the blank out space so that the space ends after the last "F" in "STAFF."

Change the horizontal location 200 in Line 134 to 220. *RUN*.

Note that we have used the regular alphabet exclusively. There is no reason why we couldn't capitalize. Change the "K"s in KT$, KR$ and KS$ to "D"s.

For demonstration purposes, if you wanted to move the addressee line a bit to the right, you could manipulate the horizontal location in Line 143 to 85 and *RUN*. If you wanted more blank space at the end of the addressee's line, extend Line 134 by changing horizontal 220 to 225 or 230.

Of course, you could use all fancy letters. In that case, change all the "K"s in Lines 143 and 144 to "D"s.

When you get the addressee line set to your liking, you can perform a similar set of trial operations on the signature line. Unmask Line 142 to blank out the signature line. Unmask Line 160 to print the signature. If you have a very long signature add Line 161.

Once you get your signature line set up, you need not bother with it anymore, unless you use a variety of signatures. For example, Joe; Joseph; Joseph Kolar.

Make any final horizontal adjustments in the addressee line, both blank out and lettering. Check it until it looks right to you. Finally, if you have a printer, run off a sample.

Use reverse printing if you use the shining light background. Use either regular or reverse printing for the other background.

If you use the alternate background, unmask Line 45. Mask Lines 92, 95 and 96. Move the addressee block to the left (see Figure 2). This will give you a little practice moving the addressee block. If you were moving it to horizontal 20, you would subtract 50 from all of the horizontal locators.

Line 134: 70-50=20 and 230-50=180. Line 143: 85-50=35. Even then, you might want to make further adjustments to suit yourself.

Figure 3

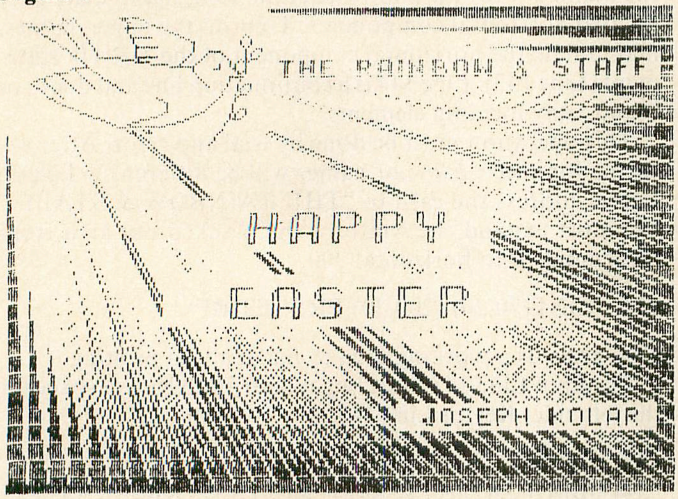


Figure 3 shows an Easter card. It would be created as follows:

Mask Line 45. Unmask Lines 92 and 95. Mask Line 96. Mask Lines 190 and 191. Unmask Lines 192 and 193. Lines 134 and 143 must be moved over to the left. The horizontal locators should be 100 and 250 in Line 134 and 105 in Line 143.

Of course, you would mask lines that you would not need.

Note that it was necessary to shorten the right blank out to 100 rather than 90 to avoid overlapping the olive branch.

After printing copies of Santa cards, you might want to use a red pencil to shade in Santa's clothing to add a little color.

There is only one way to end this — Merry Christmas And A Happy New Year!

```
  110.. 01CE
  181... 0559
10300 .. 097F
30030 ..0DA0
40410 .. 1379
  END ... 1711
```

Listing 1

```
0 'FIGURE 1
1 CLEAR 500
5 FOR I= 1 TO 5:PRINT:NEXT
10 PRINT TAB(3)"COMBO-A X-MAS/EA
STER CARD
15 PRINT TAB(10)"JOSEPH KOLAR"
20 PRINT TAB(7)"INVERNESS, FLORI
DA"
25 SCREEN 0,1:FOR Z= 1 TO 2000:N
EXT
35 PRINT:INPUT"          PRESS <E
NTER>";A0
40 PMODE 4,1:PCLS:SCREEN 1,1
45 'GOTO 51000'EASTER/CHRISTMAS
 CENTERED BACKGROUND
50 FOR X= 0 TO 256 STEP 8
60 FOR Y=0 TO 192 STEP 8
70 LINE (0,0)-(X,Y),PSET
80 NEXT Y:SOUND 100,1
85 NEXT X
90 '
91 COLOR 0,1
92 LINE(0,0)-(100,50),PRESET,BF
95 'GOTO 20000'PIGEON
96 GOTO 30000'SANTA
100 '
110 GOTO 10000
120 '
130 COLOR 0,1
134 LINE(70,20)-(230,30),PRESET,
BF'ADDRESSEE BLANK-OUT
135 'LINE(110,103)-(155,113),PRE
SET,BF' AND A BLANK-OUT
136 'LINE(75,123)-(185,133),PRES
ET,BF' HAPPY NEW YEAR BLANK-OUT
137 LINE(69,78)-(185,98),PRESET,
BF' SEASONS AND HAPPY BLANK-OUT
138 LINE(61,108)-(199,128),PRESE
T,BF'GREETINGS AND EASTER BLANK-
OUT
140 'LINE(108,70)-(147,80),PRESE
T,BF' MERRY BLANK-OUT
141 'LINE(95,80)-(161,95),PRESET
,BF' CHRISTMAS BLANK-OUT
142 LINE(150,160)-(248,170),PRES
ET,BF
143 DRAW "S4C0BM85,28"+DT$+DH$+D
E$+SS$+DR$+DA$+DI$+DN$+DB$+DO$+D
W$
144 DRAW SS$+AA$+SS$+DS$+DT$+DA$
+DF$+DF$
145 'DRAW "S4BM110,78"+KM$+KE$+K
R$+KR$+KY$ 'MERRY
150 'DRAW"BM100,93"+KC$+KH$+KR$+
KI$+KS$+KT$+KM$+KA$+KS$' CHRISTM
AS
160 DRAW "S4BM160,168"+DJ$+KO$+K
S$+KE$+KP$+KH$+SS$+DK$+KO$+KL$+K
A$+KR$' SIGNATURE LINE
170 'DRAW"BM114,111"+KA$+KN$+KD$
+SS$+KA$'AND A
180 'DRAW "BM80,131"+KH$+KA$+KP$
+KP$+KY$+SS$+KN$+KE$+KW$+SS$' HA
PPY NEW
181 'DRAW KY$+KE$+KA$+KR$'YEAR
190 DRAW "S8BM75,95"+DS$+DE$+DA$
+DS$+DO$+DN$+DS$'SEASONS
191 DRAW "BM65,125"+DG$+DR$+DE$+
DE$+DT$+DI$+DN$+DG$+DS$'GREETING
S
192 'DRAW "S8BM94,95"+DH$+DA$+DP
$+DP$+DY$'HAPPY
193 'DRAW "BM87,125"+DE$+DA$+DS$
+DT$+DE$+DR$'EASTER
200 GOTO 200
10000 '
10010 KA$="U5ER2FD3NL4D2BR3"
10020 KB$="U6R3FDGNL3FDGNL3BR5"
10030 KC$="NRHU4ER2FBD4GNL2BR4"
10040 KD$="U6R3FD4GNL3BR4"
```

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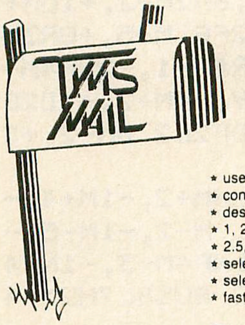

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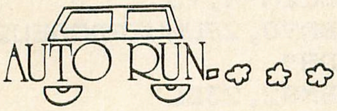
Requires 32K Extended Basic



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Auto Run will generate a machine language loader program to preceed your program on the tape. Then, to start up your program, simply type CLOADM to load in the Auto Run loader program, which will then automatically start itself up, display your title screen, load your program and then RUN or EXEC it.

Also you may record a vocal or musical introduction preceeding your program. The Auto Run loader will control the audio on/off.

Basic programs can be set to load anywhere in memory above the PCLEAR 0 page.

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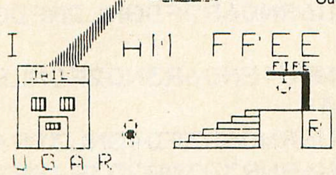

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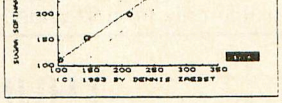

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```
10050 KE$="NR4U3NR3U3R4BD6BR3"
10060 KF$="U3NR3U3R4BD6BR3"
10070 KG$="BRHU4ER2FBD3NLDGNL2BR
4"
10080 KH$="U3NU3R4NU3D3BR3"
10090 KI$="NU6BR3"
10100 KJ$="BUNUFR2ENU5BDBR3"
10110 KK$="U3NU3R2E2UBD3BL2F2DBR
3"
10120 KL$="NU6R4BR3"
10130 KM$="U6F3E3D6BR3"
10140 KN$="U5NUF4NU5DBR3"
10150 KO$="BRNR2HU4ER2FD4GBR4"
10160 KP$="U6R3FDGNL3BF3BR"
10170 KQ$="BRHU4ER2FD4GLNUNDNLBR
5"
10180 KR$="U6R3FDGL2NLF3BR3"
10190 KS$="BUFR2EUHL2HUER2FBD5BR
3"
10200 KT$="BR2U6NL2R2BD6BR3"
10210 KU$="BRHU5BR4D5GNL2BR5"
10220 KV$="BR2H2U4BR4D4G2BR5"
10230 KW$="BUNU5FE2F2ENU5BR3BD"
10240 KX$="UE2H2UBR4DG2F2DBR3"
10250 KY$="BR2U3H2UBR4DG2BF3BR2"
10260 KZ$="NR4UE4UNL4BF3BD3"
10270 SS$="BR6" 'SPACE
10280 CM$="NUNGBR3" 'PERIOD
10290 DT$="RBR3"
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```
10300 XC$="UBU2U3BD6BR3" 'EXCLAM
ATION POINT
10310 K1$="BRU6NGBD6BR3"
10313 AA$="BR4M-3,-4UEFDG3DFRE2B
F2BR3BU"'AMPERSAND
10320 K2$="BU6R3FD2GL3D2R4BR3"
10330 K3$="BU6R3FDGNL2FDGNL3BR4"
10340 K4$="BU6D4R3NU4NRD2BR4"
10350 K5$="R3EU2HL3U2R4BD6BR3"
10360 K6$="BUNUFR2EUHL2GU3ER2FBD
5BR3"
10370 K7$="BU6R4D3GD2BR4"
10380 K8$="BRHUEHUER2FDGNL2FDGNL
2BR4"
10390 K9$="BUFR2EU4HL2GDFR2EBD4B
R3"
10400 KO$=KO$
10410 GOTO 40000
20000 '
20010 DRAW "COS8BM6,6R2M+2,+1UM+
2,+1UM+2,+1NM+3,+4U2FE M+5,+8R3M
+5,+1NM+7,+1HNR4U2NR4M-1,-2NR4M-
1,-2NR4EM-2,-1 R3M+9,+4M+2,+1D2G
3 R3DF3BU4BL3E3R2F2DF2L2 DM-2,+3
G3M-4,+2M-4,+1"
20020 DRAW"L3FLHL2FLHM+2,-1M+4,-
1M+2,-1U2M-2,-1 BG6L M-2,-1M-5,-
2M-5,-2M-5,-4 M+2,-1NF4M+3,-1NF4
R2ENF4R3M+4,+3M+3,+2 BU5BL7H2M-4
,-3M-6,-4"
20030 DRAW "BM90,29M-1,+4EUERDGL
GM-1,+4RUERDGL2M-4,+5"
20040 DRAW "BM90,29UHUEFDGDEU2EU
ERDGLGU3HUEFDG"
20050 DRAW "BM82,23DL"
20060 GOTO 100
30000 '
30010 DRAW "COS8BM15,20U2RU2E4R5
F2NRL3G4NDU3NEG2LDLFDL2 BR5BUREN
R2NFE2R4NU2NDF3D4G3LLDHL3M-3,-2U
3M+1,-2 BFDFNE2RNR4FR2ENH2EUBL2N
UL3EBUNLBRNFR2BUHGH"
30020 DRAW "BD8BL5G3D3ND2R3NU2NF
4D2L2NLDGDRNURNURNURUHUF4R4NU2R2
NU2RE5NFHG4NH3L7R7E4 NU3E2NU2RER
UNLUNLR2UL3G2LGL2NF2H2L"
30030 GOTO 100
40000 DA$="NRU5END6R3D4NL3D2RU5H
BR4BD6"
40010 DB$="NRU6RND6R2FDGNL2RFDGN
L3BR4"
40020 DC$="BUNFU4END6R3ND2FDNLBD
2NLDGNU2NL3BR4"
40030 DD$="NRU6RND6R3FD4GNL3BR4"
40040 DE$="NRU6RNR3D3NR2D3R4BR3"
40050 DF$="NRU6RNR3D3NR2D3BR6"
40060 DG$="BUNFU4END6R3ND2FDNLBD
2NL2DGNU2NL3BR4"
40070 DH$="NRU6RND6BR3NRD3NL3D3R
NU6BR3"
```

```
40080 DI$="NRU6RD6BR3"
40090 DJ$="BUNFURD2R2U6RD5GBR4"
40100 DK$="NRU6RD3RNE3NF3LD3BR7"
40110 DL$="NRU6RD6R3BR3"
40120 DM$="NRU6RND6M+2,+3M+2,-3N
D6RD6NLBR3"
40130 DN$="NRU6FND5M+3,+4U5RD6NH
BR4"
40140 DO$="BUNFU4END6R3ND6FD4GNL
3BR4"
40150 DP$="NRU6RND6R3ND3FDGNL3BD
3BR4"
40160 DQ$="BUNFU4END6R3ND6FD4GLN
L2NHFBUBR4"
40170 DR$="NRU6RND6R3ND3FDGL2NLF
3BR3"
40180 DS$="BU4NFUEND3R3FBD3HNL3F
DGNU3L3HBDBR8"
40190 DT$="BR2NRU6NL2RNR2D6BR5"
40200 DU$="BUNFU5RD6R3U6RD5NGBR4
BD"
40210 DV$="BU3NFU3RD4FDRUE2U3LD4
BD2BR4"
40220 DW$="NRU6RD6M+2,-3M+2,+3U6
RD6NLBR3"
40230 DX$="UNEBU4NFURD2NM+3,+2BD
2NM+3,-2D2NLBR3U2BU2U2RDNGBD4HD2
RNUBR3"
40240 DY$="BU4NFU2RD3RNRD3RU3RU3
RD2GBD3BR4"
40250 DZ$="BU6R4ND2RDGM-3,+2ND2G
DR5BR3"
40260 DO$=DO$:D1$=DI$
40270 D2$="BU5ER3ND3FDGL3GD2RNU3
R4BR3"
40280 D3$="BU5ER3ND3FDGNL3ND3FDG
L3NHBR8"
40290 D4$="BU3NFU3RD4R2NU4NR2D2B
R5"
40300 D5$="BUFR3NU3EUHL3HU2RND3R
3BD6BR4"
40310 D6$="BUNFU4END6R3FBD3NDHL2
GD2R3NEBR4"
40320 D7$="BU6R5G3D3RNU4BR5"
40330 D8$="BRNR3HUENR3HUEND6R3ND
6FDGFDGBR5"
40340 D9$="BUFR3NU6EU4HL3GDFR3BR
4BD3"
40350 MP$="URDNLBR3"'PERIOD
40360 MS$="BR3"'SMALL SPACE
40370 MM$="URDNLGBUBR3"'COMMA
40380 MA$="BU6URDNLGBD5BR3"'APOS
TROPHE
40390 MN$="BUURDLUBU2URDLBD4BR4"
'COLON
40400 MX$="URDLUBU2U3RD3NLBD3BR3
"'EXCLAM. PT.
40410 GOTO 120
50000 '***INFORMATION***
50010 '*** CHANGE THE <'> ON
```

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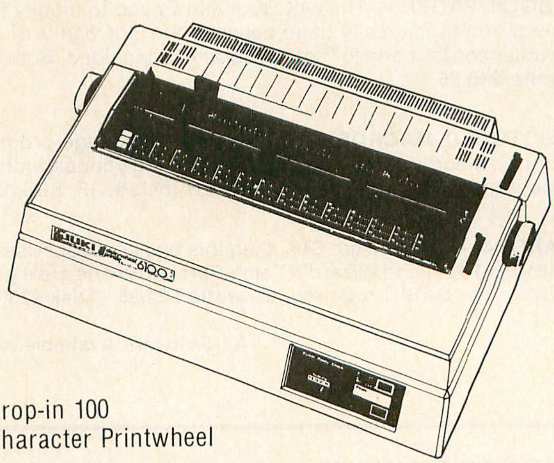

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PAGE PLUS — Attention BASIC programmers! Here is the software you've been waiting for! Up to 56K available from your BASIC programs. This utility, written by Chris Hawks, does the memory management necessary to utilize the two 32K banks of memory. Easy enough for any "intermediate" level BASIC programmer to use. Includes documentation and demo programs to show you how to use PAGE PLUS to get the most out of your computer. Works with 64K tape or disk systems. **Cassette $27.95 Disk $29.95**

MDISK — Hal Snyder's latest breakthrough for the 64K Color Computer! MDISK lets you use the upper 32K of memory for rapid storage and retrieval of programs and data. Whether you own an actual disk drive or not, MDISK puts the "hidden" 32K to work for you as a "virtual disk," with capability to save and load up to 15 programs, view a directory of files stored in "page 1," kill unwanted page 1 files, execute BASIC or machine language directly from MDISK, chain to a BASIC program while preserving data already created, and more. These functions are available not only under manual keyboard control, but from programs in progress as well, permitting high-speed swapping of programs or data. Unlike many 64K utilities, MDISK doesn't copy BASIC to RAM. This greatly increases the amount of workspace available to you (by 22K in a disk system). MDISK is written in position independent code, and will work on disk or tape based 64K systems. Full documentation included. **Cassette $27.95 Disk $29.95**

ROMBACK — Why pay more? The easiest to use ROM-pak dumping utility available! At the best price, too! Comes with full documentation, including detailed patching instructions to allow several popular "problem" cartridges to run from tape or disk. Stop plugging and unplugging your disk controller! Don't blow any more SAM chips or 6809Es! Use ROMBACK, and run those programs from tape or disk instead. Works with any 64K Extended BASIC system. **Cassette $16.95**

QUICKSORT — A machine language sort routine specifically designed to be used by BASIC programmers. Speeds up those programs where a BASIC sort is just too slow. Great for mailing lists and databases. Can be incorporated into many existing programs as well. Written in position independent code, works on tape or disk systems. 16K required. **Cassette $12.95**

64K BOOT/PAGER — The 64K Boot allows you to modify BASIC by moving it from ROM to RAM. The PAGER is a menu-driven utility allowing you to manually page between the 32K banks of memory, copying BASIC or data from one page to the other. The complete assembler source code for both programs is included. Both are written in position independent code and run on 64K tape or disk systems. **Cassette $19.95**

STRUCTURED MACROS — An assembly language programming tool for users of the Macro-80C assembler, by the Micro Works. Structured macros come close to transforming your assembler into a high-level language. Your programs become more understandable and debugging is simplified. Commands include IF, ELS, ENDIF, IFTST, IFCC, WHILE, ENDWH, REPEAT, and UNTIL. **Disk $19.95**

WIZARD 64 — If you've got 64K, then this one's for you! Uses both 32K pages of memory for graphics and action—combines the features of Wizard's Tomb and Wizard's Tomb Part II into one great game. Challenging enough for adults, yet entertaining for younger players too. 64K Extended BASIC required. **Cassette $21.95 Disk $23.95 16K version $12.95 32K version $15.95**

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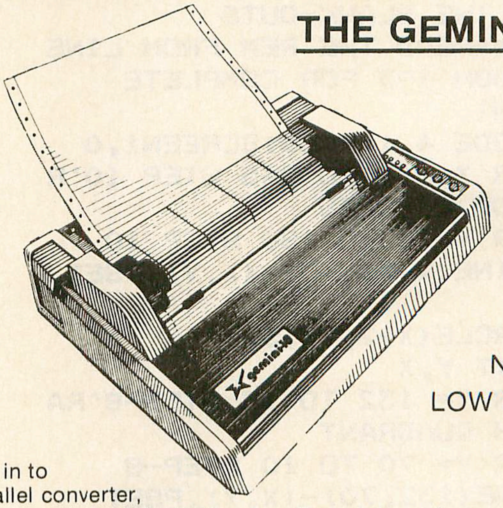

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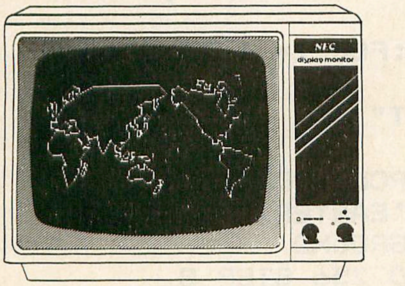

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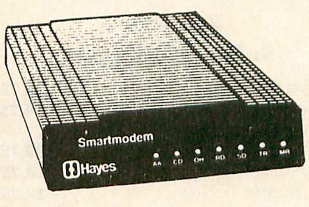

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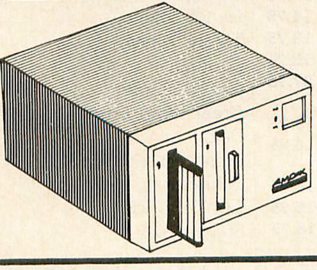

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```
LINES 92 AND 95 TO CHOOSE PIGEON
 OR LINES 92 AND 96 TO CHOOSE
SANTA.
50020 '*** LINES 190 AND 191 GET
'SEASONS GREETINGS'.
50030 '***LINE 192 AND 193 GET
'HAPPY EASTER',
50040 'USE WITH LINE 137 AND 138
WHICH IS THE BLANK-OUTS
50050 '***READ THE REM FROM LINE
134 THROUGH 193 FOR COMPLETE
BREAKDOWN!
51000 PMODE 4,1:PCLS:SCREEN1,0
51010 FOR X= 10 TO 245 STEP 10'R
OUTINE FOR CIRCLES
51020 FOR Y=10 TO 180 STEP 10
51030 'LINE(X+5,Y+3)-(X,Y),PSET,
B
51040 CIRCLE(X+2,Y),5,1
51050 NEXT Y,X
51180 FOR X= 132 TO 13 STEP-8'RA
YS FOURTH QUADRANT
51190 FOR Y= 70 TO 10 STEP-8
51200 LINE(132,70)-(X,Y),PSET
51210 NEXT Y,X
51220 FOR X=132 TO 240 STEP 8'RA
YS FIRST QUAD
```

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```
51230 FOR Y=70 TO 10 STEP-8
51240 LINE(132,70)-(X,Y),PSET
51250 NEXT Y,X
51260 FOR X=132 TO 13 STEP-8'RAY
S THIRD QUAD
51270 FOR Y=70 TO 181 STEP 8
51280 LINE(132,70)-(X,Y),PSET
51290 NEXTY,X
51300 FOR X=132 TO 240 STEP 8'RA
YS SECOND QUAD
51310 FOR Y=70 TO 181 STEP 8
51320 LINE(132,70)-(X,Y),PSET
51330 NEXT Y,X
51335 DRAW"C0BM132,70NU5NL5NR5D8
"

51340 GOTO 90
51350 GOTO 51350
```

120	01DF
193	0640
10280	094F
30030	0DAA
40410	1383
END	171B

Listing 2

```
0 'FIGURE 2
1 CLEAR 500
5 FOR I= 1 TO 5:PRINT:NEXT
10 PRINT TAB(3)"COMBO-A X-MAS/EA
STER CARD
15 PRINT TAB(10)"JOSEPH KOLAR"
20 PRINT TAB(7)"INVERNESS, FLORI
DA"
25 SCREEN 0,1:FOR Z= 1 TO 2000:N
EXT
35 PRINT:INPUT"              PRESS <E
NTER>";AO
40 PMODE 4,1:PCLS:SCREEN 1,1
45 GOTO 51000'EASTER/CHRISTMAS
CENTERED BACKGROUND
50 FOR X= 0 TO 256 STEP 8
60 FOR Y=0 TO 192 STEP 8
70 LINE (0,0)-(X,Y),PSET
80 NEXT Y:SOUND 100,1
85 NEXT X
90 '
91 COLOR 0,1
92 'LINE(0,0)-(100,50),PRESET,BF
95 'GOTO 20000'PIGEON
96 'GOTO 30000'SANTA
100 '
110 GOTO 10000
120 '
130 COLOR 0,1
134 LINE(20,20)-(180,30),PRESET,
BF'ADDRESSEE BLANK-OUT
135 'LINE(110,103)-(155,113),PRE
SET,BF' AND A BLANK-OUT
136 'LINE(75,123)-(185,133),PRES
ET,BF' HAPPY NEW YEAR BLANK-OUT
137 LINE(69,78)-(185,98),PRESET,
BF' SEASONS AND HAPPY BLANK-OUT
138 LINE(61,108)-(199,128),PRESE
```

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Inspector CLUEseau

Sherlock Holmes/Agatha Christie fans-It's finally here—A murder mystery game for the 80-C! Mr. Goodbody has been killed in his mansion and you must solve the mystery. WHO committed the murder, WHERE did it occur and HOW was it done! Question suspects, find the secret passage, and break the code to get clues. Hi-Res graphics enhances this excellent game. The computer records the clues you obtain on a clue inventory screen and also provides suspect descriptions at the touch of a finger. A fast, fun game that will sharpen your deductive skills. Every game is different!

32K Extended $19.95

Bowling Secretary

Save hours of tedious work with this efficient program. Calculates individual player average, high game and total pins, as well as team games won/lost, high series, and cumulative total team points. Also calculates team standings for each week in order from 1st to last! All data stores to tape and outputs to printer to provide professional, easy to read copy. After intitial input of league and player names all you have to do is input each week's scores - the computer does the rest!!!

16KEXT Cassette ...... $24.95 32KEXT Disk 29.95

★ SUPER DISK UTILITY ★

This one does it all! **Complete catalog** of up to 800 files in matter of minutes. (Machine language sort routine) — **Sorts Directory** in alphabetical order and writes it back to disk - **Dates files** - **Super Directory** prints directory to screen or printer showing # of granules, starting granule, date, start, end, entry address - **Purge Files** - **Complete Disk Zap** contains copy, verify, display (allowing modification of), zero and move disk file sectors; allocation table check and repair.

32K EXT DISK $44.95

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A difficult subject becomes easy to learn. Programmed learning approach divides subject content into concise frames of information. Hi-res graphic display with labelled anatomical structures follows text frames for added clarity. Visually highlights keywords and concepts. Self test questions follow each section. Provides immediate feedback to user response and displays correct answers before moving to new subject matter. Excellent for school or home use.

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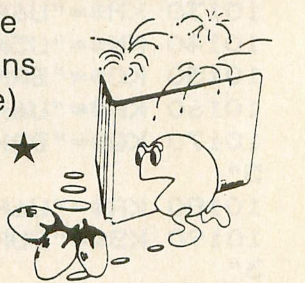
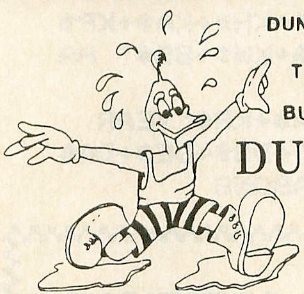


★ 16K Machine Language ★



DUNK THE DUCK BY GETTING THE POWER BUTTON.. BUT WATCH THE CLOWN!!

DUNK A DUCK

16K EXT.

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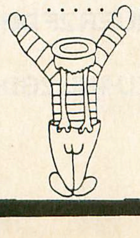

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Helps you answer "which one to buy?" when faced with real estate investment choices. Calculates after-tax return on investments for each alternative as well as the first year cash flow for each. Also tests outcomes for varying input situations (i.e., "what if ..." occupancy rate changes, loan rates higher or lower, appreciation rates on property change). Printer Output Option. Well Documented. 16KEXT Tape $24.95

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But watch for Indians and the James Gang!!

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Accommodates Placidian, Equal House, Modified Equal
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```
T,BF'GREETINGS AND EASTER BLANK-
OUT
140 'LINE(108,70)-(147,80),PRESE
T,BF' MERRY BLANK-OUT
141 'LINE(95,80)-(161,95),PRESET
,BF' CHRISTMAS BLANK-OUT
142 LINE(150,160)-(248,170),PRES
ET,BF
143 DRAW "S4C0BM35,28"+DT$+DH$+D
E$+SS$+DR$+DA$+DI$+DN$+DB$+DO$+D
W$
144 DRAW SS$+AA$+SS$+DS$+DT$+DA$
+DF$+DF$
145 'DRAW "S4BM110,78"+KM$+KE$+K
R$+KR$+KY$ 'MERRY
150 'DRAW"BM100,93"+KC$+KH$+KR$+
KI$+KS$+KT$+KM$+KA$+KS$' CHRISTM
AS
160 DRAW "S4BM160,168"+DJ$+KO$+K
S$+KE$+KP$+KH$+SS$+DK$+KO$+KL$+K
A$+KR$' SIGNATURE LINE
170 'DRAW"BM114,111"+KA$+KN$+KD$
+SS$+KA$'AND A
180 'DRAW "BM80,131"+KH$+KA$+KP$
+KP$+KY$+SS$+KN$+KE$+KW$+SS$' HA
PPY NEW
181 'DRAW KY$+KE$+KA$+KR$'YEAR
190 DRAW "S8BM75,95"+DS$+DE$+DA$
+DS$+DO$+DN$+DS$'SEASONS
191 DRAW "BM65,125"+DG$+DR$+DE$+
DE$+DT$+DI$+DN$+DG$+DS$'GREETING
S
192 'DRAW "S8BM94,95"+DH$+DA$+DP
$+DP$+DY$'HAPPY
193 'DRAW "BM87,125"+DE$+DA$+DS$
+DT$+DE$+DR$'EASTER
200 GOTO 200
10000 '
10010 KA$="U5ER2FD3NL4D2BR3"
10020 KB$="U6R3FDGNL3FDGNL3BR5"
10030 KC$="NRHU4ER2FBD4GNL2BR4"
10040 KD$="U6R3FD4GNL3BR4"
10050 KE$="NR4U3NR3U3R4BD6BR3"
10060 KF$="U3NR3U3R4BD6BR3"
10070 KG$="BRHU4ER2FBD3NLDGNL2BR
4"
10080 KH$="U3NU3R4NU3D3BR3"
10090 KI$="NU6BR3"
10100 KJ$="BUNUFR2ENU5BDBR3"
10110 KK$="U3NU3R2E2UBD3BL2F2DBR
3"
10120 KL$="NU6R4BR3"
10130 KM$="U6F3E3D6BR3"
10140 KN$="U5NUF4NU5DBR3"
10150 KO$="BRNR2HU4ER2FD4GBR4"
10160 KP$="U6R3FDGNL3BF3BR"
10170 KQ$="BRHU4ER2FD4GLNUNDNLBR
5"
10180 KR$="U6R3FDGL2NLF3BR3"
10190 KS$="BUFR2EUHL2HUER2FBD5BR
3"
10200 KT$="BR2U6NL2R2BD6BR3"
10210 KU$="BRHU5BR4D5GNL2BR5"
10220 KV$="BR2H2U4BR4D4G2BR5"
10230 KW$="BUNU5FE2F2ENU5BR3BD"
10240 KX$="UE2H2UBR4DG2F2DBR3"
10250 KY$="BR2U3H2UBR4DG2BF3BR2"
10260 KZ$="NR4UE4UNL4BF3BD3"
10270 SS$="BR6" 'SPACE
10280 CM$="NUNGBR3" 'PERIOD
10290 DT$="RBR3"
10300 XC$="UBU2U3BD6BR3" 'EXCLAM
ATION POINT
10310 K1$="BRU6NGBD6BR3"
10313 AA$="BR4M-3,-4UEFDG3DFRE2B
F2BR3BU"'AMPERSAND
10320 K2$="BU6R3FD2GL3D2R4BR3"
10330 K3$="BU6R3FDGNL2FDGNL3BR4"
10340 K4$="BU6D4R3NU4NRD2BR4"
10350 K5$="R3EU2HL3U2R4BD6BR3"
10360 K6$="BUNUFR2EUHL2GU3ER2FBD
5BR3"
10370 K7$="BU6R4D3GD2BR4"
10380 K8$="BRHUEHUER2FDGNL2FDGNL
2BR4"
10390 K9$="BUFR2EU4HL2GDFR2EBD4B
R3"
10400 KO$=KO$
10410 GOTO 40000
```

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RAINBOW CERTIFICATION SEAL

```
20000 '
20010 DRAW "C0S8BM6,6R2M+2,+1UM+
2,+1UM+2,+1NM+3,+4U2FE M+5,+8R3M
+5,+1NM+7,+1HNR4U2NR4M-1,-2NR4M-
1,-2NR4EM-2,-1 R3M+9,+4M+2,+1D2G
3 R3DF3BU4BL3E3R2F2DF2L2 DM-2,+3
G3M-4,+2M-4,+1"
20020 DRAW"L3FLHL2FLHM+2,-1M+4,-
1M+2,-1U2M-2,-1 BG6L M-2,-1M-5,-
2M-5,-2M-5,-4 M+2,-1NF4M+3,-1NF4
R2ENF4R3M+4,+3M+3,+2 BU5BL7H2M-4
,-3M-6,-4"
20030 DRAW "BM90,29M-1,+4EUERDGL
GM-1,+4RUERDGL2M-4,+5"
20040 DRAW "BM90,29UHUEFDGDEU2EU
ERDGLGU3HUEFDG"
20050 DRAW "BM82,23DL"
20060 GOTO 100
30000 '
30010 DRAW "C0S8BM15,20U2RU2E4R5
F2NRL3G4NDU3NEG2LDLFDL2 BR5BUREN
R2NFE2R4NU2NDF3D4G3LLDHL3M-3,-2U
3M+1,-2 BFDFNE2RNR4FR2ENH2EUBL2N
UL3EBUNLBRNFR2BUHGH"
30020 DRAW "BD8BL5G3D3ND2R3NU2NF
4D2L2NLDGDRNURNURNURUHUF4R4NU2R2
NU2RE5NFHG4NH3L7R7E4 NU3E2NU2RER
UNLUNLR2UL3G2LGL2NF2H2L"
30030 GOTO 100
```

```
40000 DA$="NRU5END6R3D4NL3D2RU5H
BR4BD6"
40010 DB$="NRU6RND6R2FDGNL2RFDGN
L3BR4"
40020 DC$="BUNFU4END6R3ND2FDNLBD
2NLDGNU2NL3BR4"
40030 DD$="NRU6RND6R3FD4GNL3BR4"
40040 DE$="NRU6RNR3D3NR2D3R4BR3"
40050 DF$="NRU6RNR3D3NR2D3BR6"
40060 DG$="BUNFU4END6R3ND2FDNLBD
2NL2DGNU2NL3BR4"
40070 DH$="NRU6RND6BR3NRD3NL3D3R
NU6BR3"
40080 DI$="NRU6RD6BR3"
40090 DJ$="BUNFURD2R2U6RD5GBR4"
40100 DK$="NRU6RD3RNE3NF3LD3BR7"
40110 DL$="NRU6RD6R3BR3"
40120 DM$="NRU6RND6M+2,+3M+2,-3N
D6RD6NLBR3"
40130 DN$="NRU6FND5M+3,+4U5RD6NH
BR4"
40140 DO$="BUNFU4END6R3ND6FD4GNL
3BR4"
40150 DP$="NRU6RND6R3ND3FDGNL3BD
3BR4"
40160 DQ$="BUNFU4END6R3ND6FD4GLN
L2NHFBUBR4"
40170 DR$="NRU6RND6R3ND3FDGL2NLF
3BR3"
```

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```
40180 DS$="BU4NFUEND3R3FBD3HNL3F
DGNU3L3HBDBR8"
40190 DT$="BR2NRU6NL2RNR2D6BR5"
40200 DU$="BUNFU5RD6R3U6RD5NGBR4
BD"
40210 DV$="BU3NFU3RD4FDRUE2U3LD4
BD2BR4"
40220 DW$="NRU6RD6M+2,-3M+2,+3U6
RD6NLBR3"
40230 DX$="UNEBU4NFURD2NM+3,+2BD
2NM+3,-2D2NLBR3U2BU2U2RDNGBD4HD2
RNUBR3"
40240 DY$="BU4NFU2RD3RNRD3RU3RU3
RD2GBD3BR4"
40250 DZ$="BU6R4ND2RDGM-3,+2ND2G
DR5BR3"
40260 DO$=DO$:D1$=DI$
40270 D2$="BU5ER3ND3FDGL3GD2RNU3
R4BR3"
40280 D3$="BU5ER3ND3FDGNL3ND3FDG
L3NHBR8"
40290 D4$="BU3NFU3RD4R2NU4NR2D2B
R5"
40300 D5$="BUFR3NU3EUHL3HU2RND3R
3BD6BR4"
40310 D6$="BUNFU4END6R3FBD3NDHL2
GD2R3NEBR4"
40320 D7$="BU6R5G3D3RNU4BR5"
40330 D8$="BRNR3HUENR3HUEND6R3ND
6FDGFDGBR5"
40340 D9$="BUFR3NU6EU4HL3GDFR3BR
4BD3"
40350 MP$="URDNLBR3"'PERIOD
40360 MS$="BR3"'SMALL SPACE
40370 MM$="URDNLGBUBR3"'COMMA
40380 MA$="BU6URDNLGBD5BR3"'APOS
TROPHE
40390 MN$="BUURDLUBU2URDLBD4BR4"
'COLON
40400 MX$="URDLUBU2U3RD3NLBD3BR3
"'EXCLAM. PT.
40410 GOTO 120
50000 '***INFORMATION***
50010 '*** CHANGE THE <'> ON
LINES 92 AND 95 TO CHOOSE PIGEON
 OR LINES 92 AND 96 TO CHOOSE
SANTA.
50020 '*** LINES 190 AND 191 GET
'SEASONS GREETINGS'.
50030 '***LINE 192 AND 193 GET
'HAPPY EASTER',
50040 'USE WITH LINE 137 AND 138
WHICH IS THE BLANK-OUTS
50050 '***READ THE REM FROM LINE
134 THROUGH 193 FOR COMPLETE
BREAKDOWN!
51000 PMODE 4,1:PCLS:SCREEN1,0
51010 FOR X= 10 TO 245 STEP 10'R
OUTINE FOR CIRCLES
51020 FOR Y=10 TO 180 STEP 10
51030 'LINE(X+5,Y+3)-(X,Y),PSET,
B
51040 CIRCLE(X+2,Y),5,1
51050 NEXT Y,X
51180 FOR X= 132 TO 13 STEP-8'RA
YS FOURTH QUADRANT
51190 FOR Y= 70 TO 10 STEP-8
51200 LINE(132,70)-(X,Y),PSET
51210 NEXT Y,X
51220 FOR X=132 TO 240 STEP 8'RA
YS FIRST QUAD
51230 FOR Y=70 TO 10 STEP-8
51240 LINE(132,70)-(X,Y),PSET
51250 NEXT Y,X
51260 FOR X=132 TO 13 STEP-8'RAY
S THIRD QUAD
51270 FOR Y=70 TO 181 STEP 8
51280 LINE(132,70)-(X,Y),PSET
51290 NEXTY,X
51300 FOR X=132 TO 240 STEP 8'RA
YS SECOND QUAD
51310 FOR Y=70 TO 181 STEP 8
51320 LINE(132,70)-(X,Y),PSET
51330 NEXT Y,X
51335 DRAW"COBM132,70NU5NL5NR5D8
"
51340 GOTO 90
51350 GOTO 51350
```

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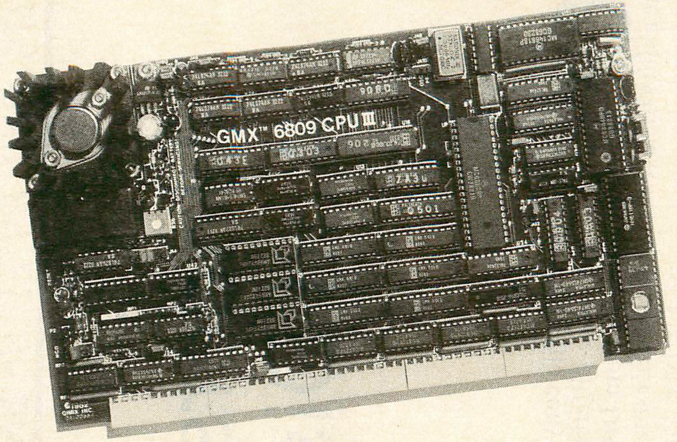

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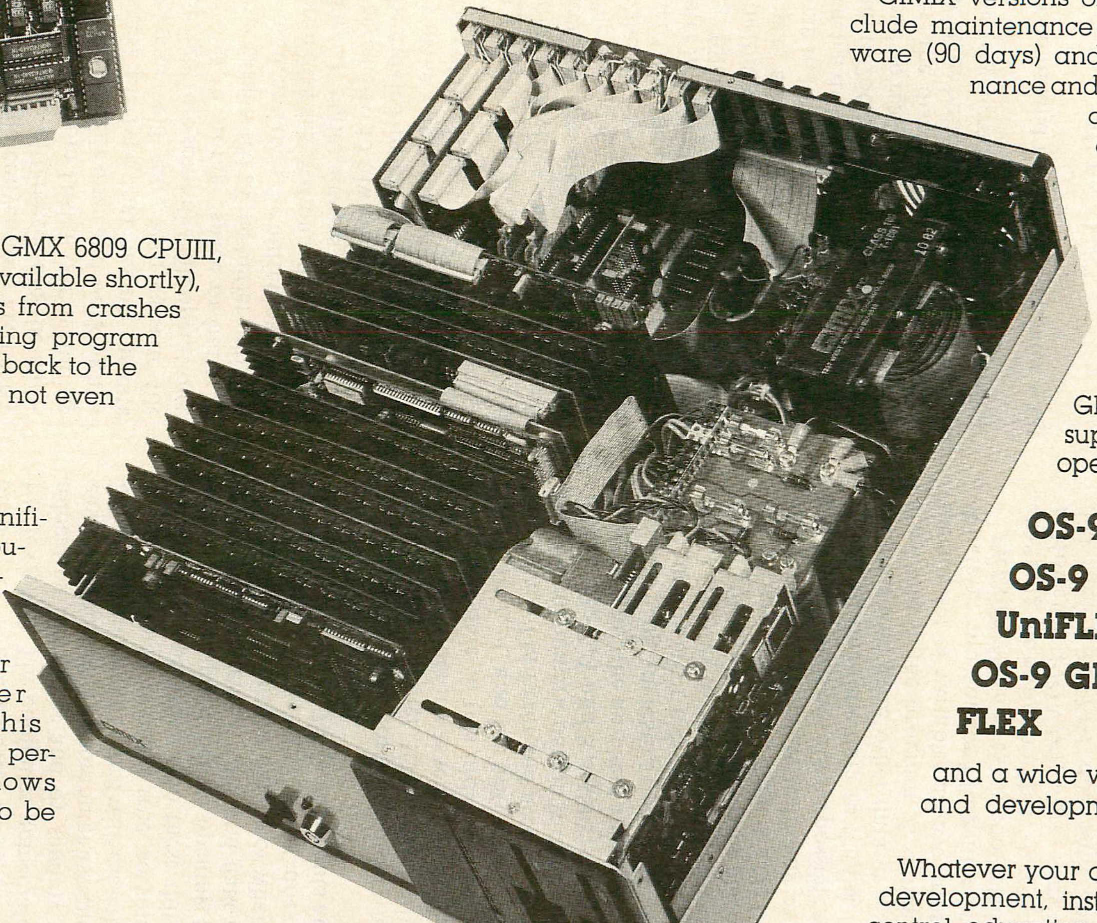

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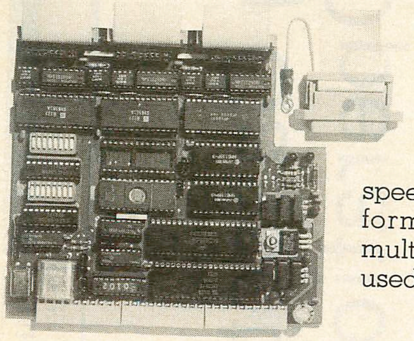

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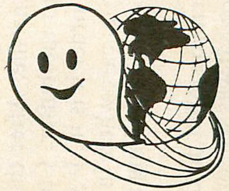

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Understanding Cassette And Disk File Operations

By Richard A. White
Rainbow Contributing Editor

CoCo's cassette and disk file conventions are nearly identical. The only basic differences are the additional options available from Disk BASIC including the ability to have more than one file open and working at a time and the direct access file type that has no cassette counterpart. This discussion will start with cassette file procedure and then slide right into some disk file operations.

Whether cassette or disk, a storage space or buffer is opened, data in character form is fed to the buffer until it is full, or until the file is closed, and then the buffer load is sent to tape or disk. The tape or disk destination is determined by the buffer number. The -1 buffer always is sent to the cassette. Buffers numbered 1 to 15 always go to disk. The buffer number may be carried in a variable so that the program operator may make a decision where data is to be sent. This permits transfer of files from tape to disk and back again.

File buffers must be defined as input or output files. Disk BASIC also supports direct access files which read or write to a single file provided certain rules are followed. Otherwise, an input or an output file is a sequential file. Data is stored in the order it is sent to the file — in sequence. Data is read back into the computer from the file in sequence. Data is returned to the computer in buffer loads just as it was saved from the the computer. File input statements read the data from the buffer until the buffer is empty, at which point the computer stops and gets another buffer full. A cassette buffer is 256 bytes, long in low memory. It is always there and available, even when a disk is in the system. Sequential file disk buffers default to 256 bytes but may be changed in size. Thus far, I have had no reason to use other than default size buffers. However, the disk buffers use memory that could be used by BASIC if the buffer size or number of buffers is redefined. If you are very memory tight, you may wish to explore this option.

You use the *OPEN* command to tell the computer what you want to do.

```
OPEN "0", -1, "FILENAME"
```

This statement tells the computer that the file is to be for output, O, it is a cassette file, -1, and that it is named FILENAME. The computer immediately opens the file by allocating the buffer and by sending a file header to the cassette recorder. The computer assumes that the cassette is connected and set to record with cassette in place. CoCo has no way to know if this is true, so you are well advised to prompt the operator to do these things and wait for the operator to respond before opening the file. After this a *PRINT#-1,* statement will send data to the buffer. CoCo does not care what the data is or what order it is in. If you want it sent, CoCo sends it. BASIC does not care where in the program the *PRINT#-1,* statements are placed as long as a file has been opened.

You pay the price for file disorder when you input the data back to the computer. It returns exactly what was sent out in exactly the order it was sent. Your program must be written to accept data in this order and deal with it. If you code *INPUT#-1, A*, and the next data in the buffer is "HAHA" you have a TM Error and need to do some fixing. Worse, is to send out numeric data in variables X, Y and Z, but to read it back into Z, Y and X. BASIC is happy because these are all numbers, but the numbers are assigned to the wrong variables and program results that use the variables will be wrong without any error message.

The best way to deal with file order is keep your *PRINT#-1,* statements all together in one place. *OPEN* the file, print out all the data and then *CLOSE* it. Then write your *INPUT#-1,* statements following exactly the *PRINT#-1,* sequence. This is not always possible so the next best thing is to put all one-time data to the file from one place in the program and print other data in a standard format from elsewhere in the program. A standard format might be a specific set of variables always printed in the same order. Whatever you do, don't forget file order.

PRINT#-1, can be easily converted to a disk command by changing the buffer number, -1, to a disk buffer number say 1. However, *PRINT#1,* works somewhat differently with a disk than *PRINT#-1,* does with tape. I bring this up now since you may be writing tape based programs that you later may want to convert to disk I/O. In the following discussion, I will attempt to show what data on the disk looks like and talk about what CoCo does when it reads it. Important: a "-" or dash will represent a space on the disk. Let's say a disk file is opened and we print to it.

```
250 PRINT#1,5"DARTS"
```

(Richard White has a long background with microcomputers and specializes in BASIC programming. With Don Dollberg, he is the author of the TIMS data base management program.)

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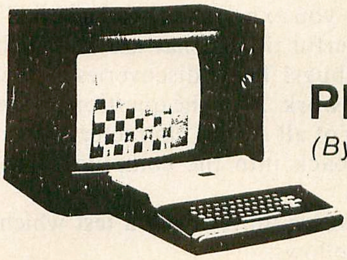

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The data on the disk will look like this:

```
-5--------------DARTS*
```

The comma established a 16-byte field and put the five with its leading space at the beginning of the field. It filled out the field with 14 spaces and then wrote DARTS. The "*" is an *end-of-statement* delimiter. Because there is at least one space between "5" and "DARTS", *INPUT#-1* X, X$ will read them in as separate variables. Now let's change the *PRINT#1,* statement.

```
250 PRINT#1,5,"THROW";"DARTS"
```

We have sent "THROW" and "DARTS" to the disk as separate words and would like to bring them back in as separate words. They are stored on disk like this:

```
-5-------------THROWDARTS*
```

Note that there is no delimiter between "THROW" and "DARTS" so the computer cannot separate these words and put them into separate variables as it can from a tape save. PRINT#1,5,"THROW","DARTS prints to disk.

```
-5--------------THROW--------DARTS-----*
```

INPUT#1,X,X1$,X2$ won't work since *INPUT#1,* accepts spaces as legal characters in a string and does not recognize them as delimiters. In this case everything from the space after the 5 to the asterisk will be put into X1$ and there will be nothing to put into X2$. The solution is to give each separate string or string variable its own separate *PRINT* statement. For a cassette based program write your print statement like this:

```
250 PRINT#-1,5 : PRINT#-1,"THROW
" : PRINT#-1,"DARTS"
450 INPUT#-1,X,X1$,X2$
```

If you convert to disk, you simply change all -1's to 1's and the program will work like a champ.

Though we used the words "THROW" and "DARTS" above for clarity, you will nearly always be printing a string variable to tape or disk rather than the string itself. There can be any ASCII character in the string and it will be saved. Whether you can read the string back in is another matter. Early in this series I talked about experimenting with BASIC. When you experiment, you will find some weird and maybe wonderful things that are not in the manuals. Don't call them bugs! These discoveries are better seen as how things really work. Now the question on the floor is how much of a string of all ASCII characters, saved to tape or disk can be read back into the computer? The answers will surprise some.

First we must devise a test which is the BASIC Program that follows:

```
5 CLEAR 10000
10 FOR X=32 TO 255 : A$=A$+CHR$(
X) : NEXT : CLS : PRINTA$ : INPU
T Y
20 OPEN"O",#1,"STRTEST" : PRINT#
1,A$ : CLOSE
30 OPEN"I",#1,"STRTEST" : INPUT#
1,A$ : CLOSE : CLS : PRINTA$
40 OPEN"I",#1,"STRTEST" : LINEIN
PUT#1,A$ : CLOSE : PRINTA$
```

Our objective is to make a string containing all ASCII characters, print it to tape twice, and then read it back in using *INPUT#-1,* and *LINEINPUT#-1.* This will show us what we can put to tape and get back. At the same time, there are some other lessons in the program. Line 10 makes our string and prints it to the screen so we can see what we have.

```
!"#$%&' ()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]'
@abcdefghijklmnopqrstuvwxyz
!"#$%&' ()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]'
@abcdefghijklmnopqrstuvwxyz
```

Above is the string as interpreted by *Telewriter* (I appended the ASCII file made by Line 20 to the *Telewriter* file for this article.). If you type in the program and run it, it will first print a blank first line where the control characters are and then start with a space followed by characters ASCII 33 and up. All screen graphics will be in the string. Above, the second series of characters tell us that the graphics character codes were indeed saved (to disk in this case), but *Telewriter* must ignore the set eighth bit and interprets these as characters 1 through 128 again.

Returning to the program, the cassette file to input is opened in line 30 and a string is obtained in line 35 using *INPUT#-1,A$*. If we are not at the end-of-file, EOF(-1), the string is printed to the screen. Here is what we get.

```
!"#$%&' ()*+,-./0123456789:;<=>?@
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]'@
abcdefghijklmnopqrstuvwxyz
```

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tape buffer, these characters cause no problems. However, the leading space seems to have been ignored. Also, none of the graphics characters which we think were sent to tape were returned.

At this point, we need to discuss getting two files in sequence off a tape. Line 30 used to look like Line 40. Then the program developed an I/O Error in Line 40. If a program, does not get all data out of an input file on tape, the tape will not run past the end of the file marker. *CLOSE* will not cause the tape to run past this marker. Line 35 is the way to handle any file input. A string or number is obtained using either *INPUT#-1* or *LINEINPUT#-1.* The test for end-of-file is then made: IF EOF(-1) THEN CLOSE -1. This tests file buffer -1, the cassette, and forces the cassette to run to the end of the file on the tape before closing the file. For disk use EOF(1) or EOF(2) etc., depending on which file you are dealing with. When dealing with disk files, always put the file number after *CLOSE. CLOSE* alone closes *all* files.

Line 40 gets the string using *LINEINPUT#-1.* The result is that *nothing* is printed. This tells me that one of the control characters at the beginning A$ is stopping *LINEINPUT#-1.* Why was *INPUT#-1* not affected the same way? Well, it was. But, Line 35 is written so that the program keeps going back to the buffer until an end-of-file is found. It might have taken two or more tries to get all the characters. You could find out by running the program with the trace function *TRON.*

```
10 FOR X=32 TO 255 : A$=A$+CHR$(X) : NEXT : CLS
:PRINTA$ : INPUT Y
```

Here, Line 10 is changed to start the string with a space, eliminating the control characters. Now, the result using *LINEINPUT#-1* is almost identical to that obtained with *INPUT#-1* except *LINEINPUT#-1* gets the leading space that *INPUT#-1* ignored.

```
 !"#$%&' ()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]'
@abcdefghijklmnopqrstuvwxyz
```

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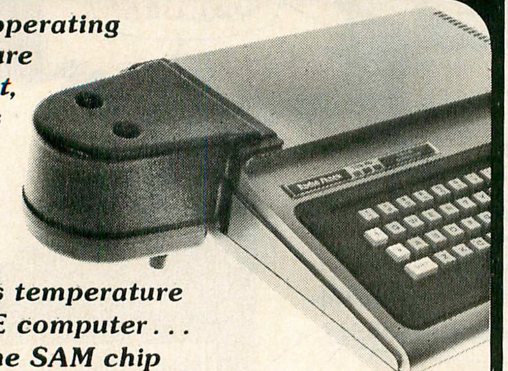

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We don't have any other commands for getting characters from the tape buffer. So while we can apparently save graphics characters onto tape, there is no way in BASIC to get them back.

The program to make the same tests from disk is below. Note that I have not bothered to get an EOF(1) in Line 30. Since a disk is random access, it cares not if a file is closed before all data is removed.

```
5 CLEAR 10000
10 FOR X=1TO 255 : A$=A$+CHR$(X)
 : NEXT : CLS : PRINTA$ : INPUT
Y
20 OPEN"O",#1,"STRTEST" : PRINT#
1,A$ : CLOSE
25 SOUND100,20 : AUDIOON : MOTOR
ON : PRINT"REWIND TAPE AND PRESS
  ENTER" : INPUT Y
30 OPEN"I",#1,"STRTEST" : INPUT#
1,A$ : CLOSE : CLS : PRINTA$
35 INPUT#-1,A$ : IF EOF(-1)THEN
CLOSE-1 ELSE : PRINTA$ : GOTO35
40 OPEN"I",#1,"STRTEST" : LINEIN
PUT#1,A$ : CLOSE : PRINTA$
250 PRINT#-1,5 : PRINT#-1,"THROW
" : PRINT#-1,"DARTS"
450 INPUT#-1,X,X1$,X2$
```

The string starts with a space, character 32, to avoid the problem of *INPUT#1* and *LINEINPUT#1* returning nothing the first pass when reading a string with leading control characters. Here is what *INPUT#1, A$* gets:

```
 !"#$%&' ()*+
```

The comma stopped the string. We had expected that to happen on input from tape, but it didn't. Now we find where there are differences with tape and disk action for the same command. This is a good reason to stay with *LINEINPUT* for string input from both tape and disk. Using *LINEINPUT#1, A$* we get the following printed to the screen:

```
 !"#$%&' ()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]'
@abcdefghijklmnopqrstuvwxyz
```

No surprises here !

Disk BASIC does have a way to recover all characters sent to the disk. It is *DSKI$* which gets data from a certain sector within a certain track and puts this data into two strings. When you print those strings, all printable characters including graphics characters are printed. This is not as simple as it sounds since you need to know exactly where on the disk the data you want is stored. Further, if the string you are recovering starts in the middle of a sector, it will be divided among one to three strings filled by *DSKI$*. Let's leave that sleeping dog lie, to be disturbed by intrepid programmers with nothing better to do.

At this point, I hope you have a better understanding of the BASIC file commands and their similarities and differen-

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ces in tape and disk systems. There are a number of disk commands which I have not written about because I have not used them much or at all. There are also the direct disk file commands which are unique to Disk BASIC and which deserve a separate discussion. We will save these for a later article.

Due to an editorial error at *the Rainbow*, the listing that follows was omitted from the November *Bits And Bytes of BASIC* column. It is a BASIC tutorial program on string handling functions.

		595	0EF5
500	028B	625	1313
525	0594	660	1725
550	0939	END	1C84

The listing:

```
5 'STRING HANDLING TUTORIAL
6 'RICHARD WHITE, 44 DOW CT.  FA
IRFIELD, OH   45014  513-829-851
0
10 CLS:NO$="things to note;":S4$
="                              "
14 GOTO500
18 PRINT@480,"press any key to c
ontinue";:FORJ=-1TO0:J=(J$=INKEY
$):NEXT:RETURN
20 FORX=1TO600:NEXT:RETURN
50 PRINT:PRINT"OIUNRJMVO9TUB    "
G              'THIS IS A ' IS NOT
ASSIGNED TO"
540 PRINT"A VARIABLE. IT IS STIL
L A STRINGBUT IS USED ONLY IN TH
E PRINT   STATEMENT IN LINE 20."
,"WHEN YOU RUN THE PROGRAM YOU G
ET":PRINT:PRINT"THIS IS A DEMONS
TRATION":GOSUB18
545 CLS:PRINT@64,"2000 S1$="CHR$
(34)"MESSAGE ONE"CHR$(34)":S2$="
CHR$(34)"MESSAGE TWO"CHR$(34)":S
3$="CHR$(34)"MESSAGE THREE"CHR$(
34)":RETURN":PRINT:PRINT"STRINGS
 THAT ARE DEFINED IN THE PROGRAM
 ARE BEST PLACED AT THE"
550 PRINT"END OF THE PROGRAM AND
 READ BY AGOSUB AT THE BEGINNING
 OF  THE  PROGRAM.  THIS MAKES B
ASIC PASS OVER THE LINE ONLY ONC
E AND      SPEEDS PROGRAM OPERATI
ON.":GOSUB18
555 CLS:PRINT@64,"10 INPUT A$":P
RINT:PRINT"THIS IS THE BASIC STA
TEMENT TO  ENTER A STRING FROM T
HE              KEYBOARD. IT WILL ACC
EPT ANY      CHARACTER except ,
;  AND "CHR$(34)".","<ENTER> TER
MINATES THE STRING"
560 PRINT"ENTRY AND STORES THE C
:GOSUB20:FORX=1TO31:PRINTCHR$(15
0+X);:NEXT:GOSUB20:PRINT:PRINT"6
453.986":GOSUB20:PRINT"^!#&%$'&)
(*=?><+.,":GOSUB20:S$="DEMONSTRA
TION":PRINTS$:GOSUB20:PRINT:RETU
RN
52 PRINT"10 S$="CHR$(34)"DEMONST
RATION"CHR$(34),"20 PRINT"CHR$(3
4)"THIS IS A "CHR$(34)"S$":RETUR
N
500 CLS:PRINT@37,"string tutoria
l program":PRINT@96,"WHAT IS A S
TRING?":GOSUB20:PRINT:PRINT"A st
ring IS ANY SERIES OF         char
acters- ANY characters WILL DO.
HERE ARE SOME EXAMPLES:":GOSUB20
:GOSUB20:GOSUB50
505 GOSUB18:CLS:PRINT,,,,:GOSUB5
0:PRINT:PRINTNO$:PRINT"ANY chara
cter- EVEN GRAPHICS     AND NON-P
RINTING CONTROL         CHARACTER
S CAN BE PUT INTO A     STRING.":
GOSUB18
510 CLS:PRINT@64,"A BACKSPACE IS
 A control             character. WHE
N YOU PRESS A KEY TO CONTINUE, T
HE COMPUTER WILL  PRINT THE STRI
NG 'DEMONSTRATION'WAIT A FEW SEC
ONDS AND PRINT A  STRING CONTAIN
ING 9 backspaces.":GOSUB18:PRINT
@292,S$;:GOSUB20
515 FORX=1TO9:BS$=BS$+CHR$(8):NE
XT:GOSUB20:PRINTBS$:GOSUB18
520 CLS:PRINT@32,"THERE ARE A NU
MBER OF WAYS TO   PUT A STRING I
NTO A COMPUTER.":PRINT:PRINT"   (
1) MAKE IT PART OF A PROGRAM.   (
2) USE INPUTS$  (COLOR BASIC)   (
3) USE LINEINPUT (EXT. BASIC)   (
4) USE INKEY$ (GET ONE
   CHARACTER AT A TIME)"
525 PRINT:PRINT"LETS START WITH
PUTTING A STRINGINTO A PROGRAM."
:GOSUB18:CLS:PRINT@32,"HERE IS A
 PROGRAM THAT KEEPS     STRINGS T
WO WAYS.",,,:GOSUB52:GOSUB18
530 CLS:PRINT@32,;:GOSUB52:PRINT
:PRINT:PRINT"IN LINE 10, THE STR
ING IS        assigned TO S$. THE
 STRING IS    NOW AVAILABLE ANYWH
ERE IN THE    PROGRAM BY USING IT
S string      variable 'S$'.",,"S
$ does not equal DEMONSTRATION."
;
535 PRINT"RATHER S$ represents T
HE STRING AND MAKES IT POSSIBLE
FOR THE   COMPUTER TO FIND THE S
TRING      assigned TO IT.":GOSUB
18:CLS:PRINT@32,;:GOSUB52:PRINT:
PRINT:PRINT"IN LINE 20 THE STRIN
HARACTERS TYPED IN THE STRING VA
RIABLE     A$.":GOSUB18
565 CLS:PRINT@64,"10 LINEINPUT A
```

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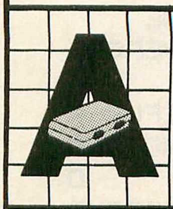

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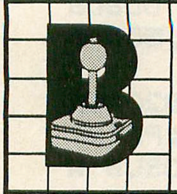

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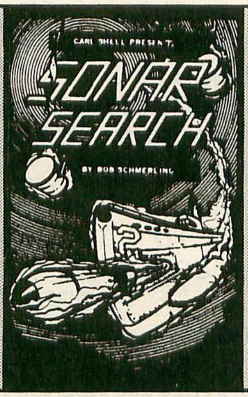

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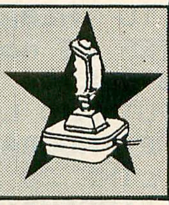

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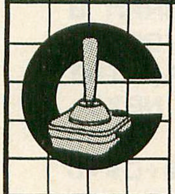

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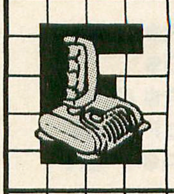

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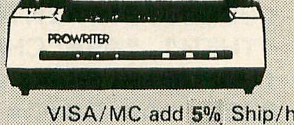

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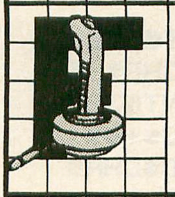

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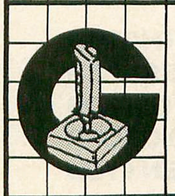

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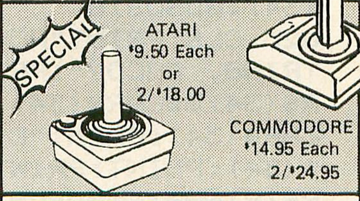

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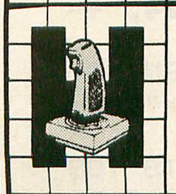

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```
$":PRINT:PRINT"THIS IS AN EXTEND
ED BASIC         STATEMENT TO  ENT
ER A STRING      FROM THE KEYBOARD
. IT WILL        ACCEPT ANY CHARAC
TER THAT CAN     BE TYPED.",,"<ENT
ER> TERMINATES THE"
570 PRINT"STRING ENTRY AND STORE
S THE       CHARACTERS TYPED IN TH
E STRING   VARIABLE A$.":GOSUB18
575 CLS:PRINT@64,"20 I$=INKEY$:I
F I$="CHR$(34)CHR$(34)" THEN20 E
LSE RETURN":PRINT:PRINT"ABOVE IS
 THE SUBROUTING TO GET  ONE CHAR
ACTER ONLY FROM THE KEY-BOARD AN
D RETURN IT IN I$ TO THEBASIC PR
OGRAM. THE CHARACTER IS not prin
ted  AS CHARACTERS ARE"
580 PRINT"WHEN INPUT AND LINEINP
UT ARE     USED. THE PROGRAM KEEP
S GOING    BACK TO LINE 20 UNTIL
A KEY IS   PRESSED.":GOSUB18
585 CLS:PRINT@64,"20 I$=INKEY$:I
F I$="CHR$(34)CHR$(34)" THEN20 E
LSE RETURN":PRINT:PRINT"USE THE
INKEY$ ROUTINE WHEN YOU ONLY WAN
T ONE CHARACTER FROM THEKEYBOARD
 TO USE IN DETERMINING  WHAT THE
 PROGRAM IS TO DO NEXT."
590 PRINT"IT SAVES THE USER FROM
 ALWAYS     HAVING TO PRESS <ENTE
R>.":PRINT:PRINT"590 GOSUB20: IF
 I$="CHR$(34)"Y"CHR$(34)" THEN 6
50 ELSE IF I$="CHR$(34)"N"CHR$(3
4)" THEN 700 ELSE 590";:GOSUB18
595 CLS:PRINT@64,"20 I$=INKEY$:I
F I$="CHR$(34)CHR$(34)" THEN20 E
LSE I=VAL(I$):RETURN":PRINT:PRIN
T"IF A NUMBER IS NEEDED, INKEY$
  CAN STILL BE USED WITH THE
  ADDITION OF  I=VAL(I$)  BEFORE
  THE RETURN.";
600 PRINT" THIS IS MOST USEFUL W
HEN USED WITH A MULTIPLE CHOICEM
ENU AND  ON I GOSUB  OR         O
N I GOTO.":PRINT:PRINT"120 GOSUB
20:ON I GOSUB 200,300, 400,500":
GOSUB18
605 CLS:PRINT@64,"120 GOSUB20:ON
 I GOSUB 200,300, 400,500":PRINT
:PRINT"HERE IS HOW  ON I GOSUB W
ORKS.  IF I=1 THEN THE PROGRAM G
OES TO LINE 200, IF I=2 IT GOES
TO 300 ETC. IF I IS NOT 1-4, THE
       PROGRAM GOES TO THE NEXT
BASIC  LINE.":GOSUB18
610 CLS:PRINT@64,"200 A$=B$+C$+D
$":PRINT:PRINT"STRINGS MAY BE AD
DED TO EACH     OTHER. THIS IS CA
LLED            CONCATENATION.":P
RINT:GOSUB20:GOSUB20:B$="STRING
":D$="DEMO.":C$="CONCATENATION "
:PRINT"B$="CHR$(34)B$CHR$(34),"D
$="CHR$(34)D$CHR$(34)
615 PRINT"C$="CHR$(34)C$CHR$(34)
:GOSUB18:PRINT@352,"A$=B$+D$
 THEN","A$="CHR$(34)B$D$CHR$(34)
:GOSUB18:PRINT@352,S4$;S4$:PRINT
@352,"A$=C$+D$      THEN","A$="CH
R$(34)C$D$CHR$(34):GOSUB18
620 PRINT@352,S4$;S4$:PRINT@352,
"A$=D$+C$       THEN","A$="CHR$(3
4)D$C$CHR$(34):GOSUB18:PRINT@352
,S4$;S4$:PRINT@352,"A$=B$+C$+D$
   THEN","A$="CHR$(34)B$C$D$CHR$
(34):GOSUB18
625 CLS:PRINT"HOW LONG IS THAT S
TRING, COCO?":PRINT:PRINT"B$="CH
R$(34)B$CHR$(34),"D$="CHR$(34)D$
CHR$(34):PRINT"C$="CHR$(34)C$CHR
$(34):PRINT:PRINT"LENGTH=LEN(YOU
RSTRING$)":GOSUB18:PRINT@224,"B=
LEN(B$)","B="LEN(B$):PRINT
630 PRINT"C=LEN(C$)","C="LEN(C$)
:PRINT:PRINT"D=LEN(D$)","D="LEN(
D$):GOSUB18
635 CLS:PRINT"WHAT COCO PUTS TOG
ETHER-","     COCO CAN TAKE APART
.":PRINT:PRINT"B$=LEFT$(A$,L)",,
"B$=MID$(A$,X,L)",,"B$=RIGHT$(A$
,L)":PRINT:PRINT"THESE FUNCTIONS
```

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```
 EXTRACT A PART  OF ONE STRING F
ROM ANOTHER AND  ASSIGN THAT PAR
T TO A STRING"
640 PRINT"VARIABLE.":A$="STRING
FUNCTIONS DEMO":GOSUB18:CLS:PRIN
T@64,"B$=LEFT$(A$,5)":PRINT:PRIN
T"THIS TELLS COCO TO GET THE LEF
T FIVE (5) CHARACTERS THAT ARE I
N STRING A$ AND PUT THEM IN STRI
NGB$.":PRINT:PRINT"  A$="CHR$(34
)A$CHR$(34):GOSUB18
645 PRINT@386,"B$="CHR$(34);:PRI
NT@326,"!!!!!":GOSUB20:PRINT@358
,"!!!!!":GOSUB20:PRINT@390,"STRI
N"CHR$(34):GOSUB18
650 CLS:PRINT@64,"B$=MID$(A$,8,9
)":PRINT:PRINT"THIS TELLS COCO T
O GET THE NINE (9) CHARACTERS ST
ARTING AT       POSITION EIGHT (8
) IN STRING A$ AND PUT THEM IN S
TRING B$.":PRINT:PRINT"  A$="CHR
$(34)A$CHR$(34):GOSUB18
655 PRINT@386,"B$="CHR$(34);:PRI
NT@333,;:FORX=1TO9:PRINTCHR$(95)
;:NEXT:GOSUB20:PRINT@361,;:FORX=
1TO9:PRINTCHR$(95);:NEXT:GOSUB20
:PRINT@390,"FUNCTIONS"CHR$(34):G
OSUB18
660 CLS:PRINT@64,"B$=RIGHT$(A$,4
)":PRINT:PRINT"THIS TELLS COCO T
O GET FOUR (4) CHARACTERS STARTI
NG AT THE RIGHTEND OF STRING A$
AND PUT THEM INSTRING B$.":PRINT
:PRINT"  A$="CHR$(34)A$CHR$(34):
GOSUB18
665 PRINT@386,"B$="CHR$(34);:PRI
NT@343,;:FORX=1TO4:PRINTCHR$(95)
;:NEXT:GOSUB20:PRINT@366,;:FORX=
1TO4:PRINTCHR$(95);:NEXT:GOSUB20
:PRINT@390,"DEMO"CHR$(34):GOSUB1
8
670 CLS:PRINT"COCO CAN CONVERT A
 NUMBER TO A  STRING.":PRINT:PRI
NT"B$=STR$(X)":PRINT:PRINT"WHY Y
OU ASK? EXTENDED BASIC    PLAY
AND SOME GRAPHICS COMMANDS NEED
NUMBERS TO BE IN STRINGS.  ALSO
PUT NUMBERS INTO STRINGS   BEFOR
E COMPARING AND AVOID"
675 PRINT"ERRORS DUE TO FLOATING
 POINT    NUMBER STORAGE. Type a
ny number or  0  to continue."
680 PRINT@448,"";:INPUT X:IFX<>0
 THEN B$=STR$(X):PRINT"B$="B$;:G
OSUB20:GOSUB20:GOSUB20:PRINT@448
,"":PRINTS4$;:GOTO680
685 CLS:PRINT"PROBLEM-",,"WRITE
A BASIC LINE THAT PRINTS  THIS T
EXT complete WITH QUOTES.",,,"A$
="CHR$(34)"DEMONSTRATING CHR$()"
CHR$(34):PRINT:PRINT"THIS LINE D
OESN'T WORK-":PRINT
690 A$="100 PRINT"+CHR$(34)+"A$=
"+CHR$(34)+"DEMONSTRATING CHR$()
"+CHR$(34)+CHR$(34):PRINTA$:PRIN
T"CAN YOU FIGURE OUT WHY?":GOSUB
18:CLS:PRINTA$:PRINT
695 PRINT"THE "CHR$(34)" SYMBOL
TELLS THE COMPUTER WHEN  TO STAR
T AND STOP A        STRING. YOU C
ANNOT PUT ONE IN A STRING AND  H
OPE IT WILL BE      PRINTED. IT S
TOPS THE STRING     INSTEAD. BUT,
 THIS TUTORIAL"
700 PRINT"PROGRAM PRINTS "CHR$(3
4)"'S.   WHY?":GOSUB18:CLS:PRINT
A$:PRINT:PRINT"THIS PROGRAM USES
  "CHR$(34)"CHR$(34)"CHR$(34)" T
ODO THE JOB. CHR$(34) TELLS THE
 COMPUTER TO PRINT THE CHARACTER
 WHOSE ASCII VALUE IS 34. THAT"
705 PRINT"CHARACTER IS A "CHR$(3
4)".":PRINT"STUDY LINES 685 TO 6
90 OF THIS  TUTORIAL TO SEE HOW
IT IS DONE. THAT'S IT FOR NOW- I
 HOPE YOU   HAVE LEARNED SOMETHI
NG":GOSUB18:LIST685-690
890 END
2000 SAVE"STRINGTU",A
```

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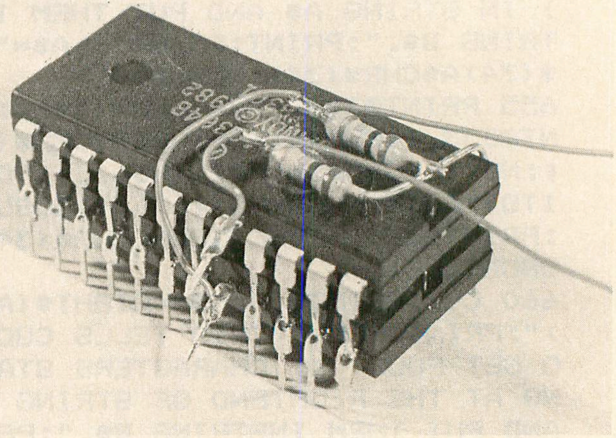


By Tony DiStefano
Rainbow Contributing Editor

If you feel two ROMs are better than one, try this month's hardware mod project.

Ready 1.0, 1.1, 1.2, 7.5, 9.4 hike! No, this is not a football lesson. It's a problem that Radio Shack has presented Color Computer users. There are presently three versions of the BASIC ROM. These are 1.0, the very first version to come out; 1.1, the second one to come out and probably the most common; and the latest one, 1.2. There are many differences between them, (I am not about to describe all of their differences in this article), but when a friend of mine bought the latest version of the Color Computer, he was very happy to find out that a lot of the basic software ran a little faster on the 1.2 version. Of course, I wanted the newer version, too. But I also wanted to be compatible with the older software. I wanted the best of the two worlds. So I got out my old soldering iron and proceeded to do just that. I'll show you how to modify your computer to have and be able to select between two of them.

The first thing you'll need to know is what version you have in your computer. The way to do that is simple. You just have to type in: EXEC 41174 [ENTER]. This will tell you what version you have. If you don't have the 1.2 version then read on! You, too, may want to be able to select between the two. If you have the 1.2 version already, you may want to have the 1.1 version also. If you have 1.0, you may want to have 1.1 also, or 1.2 — in fact you may have any two of the ROMs.

The next thing you have to do is to acquire the newer 1.2 BASIC ROM (or whichever one you want to add). I went to my local Radio Shack Computer Center and tried to order one. They said that it would take weeks to arrive. I am much too impatient to wait that long, so I called up my old friend Bob Rosen from Spectrum Projects. He had some in stock and sent me one right away.

Now it's time to get down to the nitty-gritty of this month's project. All you will need for this project is the 1.2 ROM (or any other), two 10K ohm resistors and a single pole double throw switch. A good switch to use is a RS #275-625. Any SPDT switch will work, but I like this one because it is very small and will fit almost anywhere. Open your computer in the usual way. Remove the BASIC ROM with an IC remover. If you don't have an IC remover, a small flat screwdriver will work. Stick the blade under one side of the IC. Push in very slowly. The IC should start to lift. Don't push too hard or too far in. Push in just enough so that the IC begins to lift. Now remove the screwdriver and insert it in the other end. Again push in until it starts to lift. Keep doing this procedure back and forth until the IC comes out.

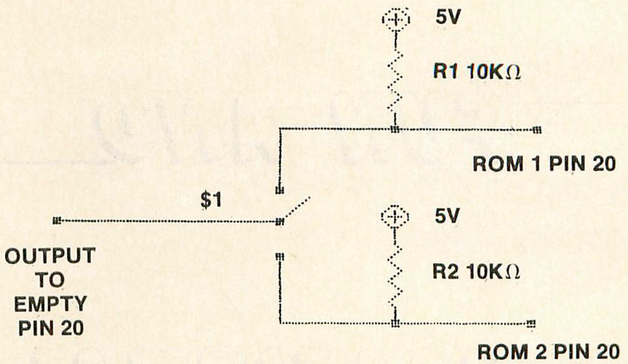
Next, mount the new IC on top of the old one. Make sure that pin 1 on the old pin matches pin 1 on the new one. It's time to solder them together, but leave a space in between the two chips, so that the air can circulate between the chips and keep them cool. You don't want a heat problem to

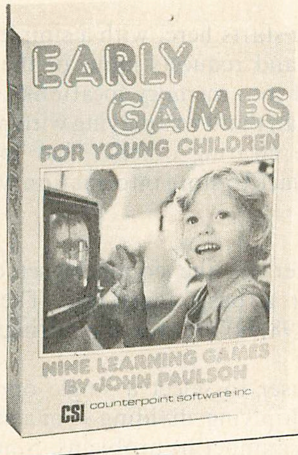
(Tony DiStefano is well known as an early specialist in Color Computer hardware projects. He is one of the acknowledged experts on the "insides" of CoCo.)

develop. I used a popsicle stick as a spacer. Solder all the pins except pin 20. Leave pin 20 of the two ROMs unsoldered. In fact, pull them apart a little just to be sure that you don't. Next, cut the two 10K ohm resistors so as to make them fit. Examine Photo 1 to get the proper positioning of the two resistors. Solder them together according to the photo. Solder the resistors to pin 1 of the IC pack (or better known as piggy-back — remember 32K). Next, take two small pieces of light gauge wire (wirewrap wire 278-501 from RS is a good wire to use) and wire the resistors and the protruding pins together using Figure 1 as schematic. Remember to clean any residue left from soldering. Solder the other ends of thes wires to each side of switch 1. The center pin of the switch goes to the empty pin 20 on the socket, the pin that we lifted earlier. The best way to do that is to take a $^{3}/_{16}$″ piece of stiff wire (a snipped off piece of resistor lead will do just great) and solder it to the end of the wire. The end of this wire will go into the empty pin of the socket.

Find a good spot to mount the switch. You will need a $^{3}/_{16}$″ drill bit and drill if you used the RS one. I mounted mine on the back cover just left of the reset button. Okay, now insert the IC pack into the socket. Make sure that pin 20 on the bottom IC does not enter the socket. It must be bent enough so that it rests on the outside of the socket and another wire can be inserted into the hole. Insert the wire that comes from the center pin of the switch into the hole. Check your work carefully. When you think all is right, turn on the computer. Make a note which side the switch is on and type in EXEC 41175. This will tell you which ROM is active. Turn the computer off, flip the switch and turn it on again. Type in EXEC 41175 again. Now you should have the other ROM active. Note the setting on the switch and mark it above the switch. Flipping the switch when the computer is on will not harm the computer but it is not recommended because the BASIC interpreter might get lost. That is to say, the software expects certain routines to be in certain places. If you switch the routines around (by switching the ROMs) without telling BASIC about it, BASIC will jump to the wrong place and get lost. Close up the computer and tidy up your room. I'll see you next month.

Figure 1





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FAST, FUN AND EDUCATIONAL — THAT'S SPEEDMATH

By Thomas Gray

(Tom Gray, BSc., BEd., has received two awards for innovative science teaching. His interests include computers, electronics, and "things that fly.")

Brightly colored clowns, fireworks, and smile faces appeal to educational programmers as rewards or motivators. How many smile faces and fireworks displays do you see in the average video arcade? Darned few! Yet there is no doubt that most arcade games are highly motivating: it is one quality of a good arcade game that you *want* to plug in one more quarter to get just another thousand points.

That higher score is both an achievement and a reward. Once the basics of a game or subject are mastered, increasing competence is itself a strong motivator. Thus, the student who can handle basic math facts with some degree of speed and accuracy will be motivated by the challenge of *increased* speed and accuracy. As a teacher, I've experienced this.

Speedmath presents a series of basic math facts* at lightning pace. As quickly as the user can hit the keys, the next question appears. To add to the challenge, a colored bar shrinks and a countdown timer ticks inexorably down to zero. When the questions are finished, the student gets a rating of his performance, a score and a list of missed problems.

The program can be as addictive as an arcade game. "Please, Mr. Gray," one of my students will plead, "just one more game! I'm up to 'QUIZ WHIZ' and I only missed 'SUPER WHIZ' by three seconds!" I've had to shut off the computer to get some students to quit!

Program Outline

100—200

The program nominally starts here, with a simple cover that prints the color bar and requests input of the user's name. The name is poked into memory locations 1000 to 1009 for no other reason than that I was playing with ways to retain some strings while clearing others. That location turned out to be a handy place to store information without crashing the program.

200—300

This short section generates the complete set of 100 number pairs needed for a basic facts test. The pairs (00,01,02 . . . 10,11,12 . . . 98,99) are stored as strings.

300—400

The menu allows the user to select a single operation —adding, subtracting, multiplying, dividing — or a mixture of the four, and to set the number of problems. Since division by zero is unworkable, the program restricts the number of questions to 88 for this option and for the mixed problems. You can change the minimum number of problems by altering lines 335 and 345.

400—500

Here the user selects a difficulty level. This basically sets the average time available to do each problem. Level 6 (Beginner) gives six seconds per problem, while level 1 (Super Whiz) allows only one second per problem. On subsequent games, the level is determined by previous performance, and this menu is bypassed. The level, like the name

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and the time (and for the same reason), is poked into a low memory location, in this case address 256.

500—590

The display menu allows the user to choose any, all or none of the display options: color bar, countdown timer (called stopwatch in the program) and a periodic "tick." Some students are spurred on by these displays, while others may find that the display raises their anxiety too much, or is too distracting.

600—690

Arrays are set up to hold the questions, correct answers, and incorrect student responses. String functions are used to convert the number pairs (Lines 200—290) into appropriate math problems. The specified number of pairs is selected at random from the bank of 100 (or 88 if division is involved; division by zero is checked at Line 665). Subtraction is defined as the sum of addends less one of the addends (in Line 655) to avoid negative differences; division is similarly treated (Line 665) to ensure whole number quotients. Since I dislike having a computer just sit — I always wonder if it's hung up — Lines 670—680 make random sounds and print soothing assurances that progress is being made.

700—790

Line 710 sets some variables; the timer is not reset until the last possible moment, at Line 725. Probably the simplest way to alter the ratings might be to change variable <D> in line 710. For example, D=2*NQ*(K-0.5) would allow the user more time to respond. The answer retrieval in Lines 740—755 involves *INKEY$* rather than *INPUT*. This is much faster, involving one less keypress per answer ([ENTER] is not needed). *INKEY$* also allowed easier access to the decrement subroutine. The *INKEY$* strings are compared to the correct answer in Line 760 and the appropriate scores incremented.[1]

800—890

A kind of report card gives the number right, examines errors and time to revise the rating (Line 845—960), and lists the problems needing further work. If I had a printer, I'd want a hard copy of this.

Subroutines

15

This subroutine handles the time displays. Because it is accessed so often, it is right up front. (I've read that this increases execution speed. On this program it didn't seem to make much difference.)

1000

Draws the color bar for the cover and timing displays.

2000

A friendly pause to continue when the user is ready.

3000

Someday there'll be bells and whistles — put in your favorite sounds and melodies.

4000

Instructions.

Variables

T — timer value to shorten color bar
SW — stopwatch flag
CB — color bar flag
P — screen location for color bar
SD — sound flag
X — screen location for cover graphics; counter location elsewhere
W — delay counter
N$ — user name
M — memory location for N$; marker for random problems
P$ — number pair array
S$ — sign array
N — counter in fact pair generation
Y — ditto
S — sign (operation) of problem
NQ — number of questions
R$ — rating
K — difficulty level
L$ — left number in problem
L — value of L$
R$ — right number in problem
R — value of R$
NW$ — array for incorrect responses
CA — array for correct answers
Q$ — array for questions
Q — question counter
A$ — student answer keypress
B$ — ditto
A — numerical value of student response
NW — counter for incorrect responses

**A basic fact is a pair of single digit numbers on which a mathematical operation (such as adding, subtracting, etc.) can be performed without regrouping (commonly called "carrying" in addition or multiplication, "borrowing" in subtraction, and "bringing down" in division).*

[1] *As noted in the instructions,* ***INKEY$*** *does not allow the player to correct an answer. In a speed test, a correction costs in elapsed time, so* ***Speedmath*** *urges the player to press on.*

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MIN	—	number of whole minutes in SEC
SEC	—	number of seconds elapsed
LEFTOVER	—	seconds left after min is subtracted from sec
LEV	—	rating based on performance (replaces K)
G$	—	repeat game input

50....016C	615....0C89
150....032B	715....0F53
235....0531	835....11A4
345....0793	900....1430
435....09E8	4000 ...169E
	END ...1936

The listing:

```
1 ' ***** SPEED MATH ******
2 'BY T. GRAY
3 'BOX 39, SUNNYBROOK, ALBERTA
4 'CANADA TOC 2MO
5 '
10 PMODE0:PCLEAR1:GOTO 100
15 '***SUBROUTINE TO DECREMENT C
OLOR BAR AND/OR TIMER DISPLAY***
20 T=INT(TIMER/D)
25 IF PEEK(255)=T THEN RETURN
30 IF T<256 THEN POKE 255,T
35 IF TIMER>30000THENPLAY"T1;L1;
12":END
40 IF SW=1THENPRINT@11,D/2 - INT
(TIMER/60);
45 IFCB=1ANDP>=1408 THEN POKE P,
96:P=P-1
50 IFP<1408 THEN RETURN
55 IF SD=1 THENPLAY"T50;10"
60 RETURN
65 '
100 '***COVER DISPLAY***
105 CLS:PRINT@169,"SPEED MATH"
110 FOR X=1024 TO 1055:POKEX,166
:POKEX+480,166:NEXT
115 FOR X=1024 TO 1504 STEP32:PO
KEX,166:POKE X+31,166:NEXT
120 POKE256,0:CB=1: GOSUB1000
125 FORP=1438 TO 1409STEP-1
130 POKEP,96:FORW=1TO50:NEXTW:PL
AY "T50;V20;10":PRINT@233,RND(9)
;" + ";RND(9);
135 NEXT P
140 PRINT@233,"BY T. GRAY";
145 FORW=1TO150:NEXTW:FORT=1TO5:
SOUND10,2:NEXT
150 PRINT@233,"          ";:PRIN
T@292,"PLEASE TYPE YOUR NAME";:P
RINT@324,"AND PRESS <ENTER>";:PR
INT@356,"";:INPUT N$:N$=N$+","
155 IF LEN(N$)>10 THEN PRINT@356
,STRING$(15," "):PRINT"TOO LONG.
 GIVE ME A SHORTER NAME":GOTO150
160 CLS:GR$="HELLO, "+N$:PRINT@1
44-(LEN(GR$)/2),GR$:PRINT:PRINT:
```

```
PRINT"     WELCOME TO SPEED MATH
.":PRINT:PRINT"  DO YOU WANT INS
TRUCTIONS?":PRINT"  TYPE <Y> OR
<N> AND <ENTER>":INPUT A$:IFLEFT
$(A$,1)="Y"THENGOSUB4000
165 CLS:PRINT"ONE MOMENT, PLEASE
....":M=1000:FOR X=1TO LEN(N$):P
OKE M,ASC(MID$(N$,X,1)):M=M+1:NE
XTX:FORX=M TO 1009:POKEX,32:NEXT
X
170 PLAY"T5;L2;C;E;G;L2;C"
180 '
200 '***GENERATE FACT PAIRS***
205 CLEAR1000
210 DIMP$(100),S$(4)
215 N=1:FORX=0TO9:FORY=0TO9
220 P$(N)=STR$(X)+STR$(Y)
225 N=N+1
230 NEXTY,X
235 GOSUB 2000
240 FORX=1000 TO 1009:N$=N$+CHR$
(PEEK(X)):NEXTX
250 '
300 '***SELECT # AND KIND OF QUE
STIONS***
305 CLS:PRINT@42,"SPEED MATH"
310 PRINT@100,"WHAT KIND OF PROB
LEMS?":PRINT
315 PRINTTAB(10)"1. ADDITION":PR
INTTAB(10)"2. SUBTRACTION":PRINT
TAB(10)"3. MULTIPLICATION":PRINT
TAB(10)"4. DIVISION":PRINTTAB(10
)"5. MIXED"
320 PRINT@353,"TYPE THE NUMBER O
F YOUR CHOICE  AND PRESS <ENTER>
"
325 INPUT S
330 IF S<1 OR S>5 OR S<>INT(S)TH
ENPRINT@321,"ENTER A NUMBER FROM
 1 TO 5 ONLY":GOTO325
335 CLS:PRINT@100,"HOW MANY QUES
TIONS?":PRINT@162,"TYPE A NUMBER
 FROM 10 TO 100     AND PRESS <EN
TER>.";
340 INPUT NQ
345 IF NQ<10 OR NQ>100 OR NQ<>IN
T(NQ) THEN PRINT@100,STRING$(32,
" "):PRINT@164,"PLEASE ENTER A N
UMBER":PRINT" FROM 10 TO 100.";:
GOTO340
350 IF S=4 AND NQ>88 OR S=5 AND
NQ>88THENPRINT@96,STRING$(5," ")
:PRINT@160,"SORRY, THERE ARE ONL
Y 88        DIFFERENT DIVISION F
ACTS, SO    THE MOST YOU CAN DO
IS 88!!     PLEASE ENTER A SMALL
ER NUMBER!":GOTO340
360 '
400 '***SET TIME***
405 DATA SUPER WHIZ,QUIZ WHIZ,PL
AIN WHIZ,GEE WHIZ,SLOW WHIZ,BEGI
NNER
410 FOR X=1TO6:READ R$(X):NEXT
415 CLS:IF PEEK(256)=0THEN PRINT
:PRINT"CHOOSE YOUR DIFFICULTY LE
VEL:":PRINT:FORX=1TO6:PRINTTAB(5
)X" ";R$(X):NEXT X:GOTO 420 ELSE
440
420 PRINT:PRINT"caution: AT THE
HIGHEST LEVEL   YOU WILL HAVE ON
LY 1 SECOND TO  DO EACH PROBLEM!
!!!"
425 INPUT K
430 IF K<1 OR K>6 OR K<>INT(K)TH
ENPRINT@224,STRING$(96," "):PRIN
T"ENTER A NUMBER FROM 1 TO 6 ONL
Y":GOTO 425
435 GOTO 505
440 PRINT@128,N$:PRINT:PRINT"YOU
 ARE NOW RATED AS":PRINT TAB(5)P
EEK(256)TAB(10)R$(PEEK(256))
445 K=PEEK(256):GOSUB2000
450 '
500 '***SELECT DISPLAY***
505 CLS:PRINT@64,"CHOOSE THE TIM
E DISPLAY YOU WANT":PRINT"(TYPE
Y FOR YES, N FOR NO AND    <ENTER
>)"
510 PRINT@229,"1. COLOR BAR ":PR
```

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```
INT@293,"2. STOPWATCH ":PRINT@35
7,"3. SOUND"
515 PRINT@244,"";:INPUT"Y/N";CB$
:PRINT@244,LEFT$(CB$,1);" ":IFL
EFT$(CB$,1)="Y"THENCB=1 ELSE CB=
0
520 PRINT@308,"";:INPUT"Y/N";SW$
:PRINT@308,LEFT$(SW$,1):IF LEFT$
(SW$,1)="Y"THENSW=1 ELSE SW=0
525 PRINT@372,"";:INPUT"Y/N";SD$
:PRINT@372,LEFT$(SD$,1):IF LEFT$
(SD$,1)="Y" THEN SD=1 ELSE SD=0
530 GOSUB2000
535 CLS:PRINT@128,"ONE MOMENT, P
LEASE...."
540 '
600 '***DEFINE SIGNS, MAKE QUEST
IONS***
605 DATA " + "," - "," X "," / "
610 FORX=1TO4:READS$(X):NEXTX
615 '***SELECT NQ FACT PAIRS***
620 IF S<>5 THEN M=S
625 DIM NW$(NQ),CA(NQ),Q$(NQ)
630 FORQ=1TONQ
635 N=RND(100):IFP$(N)=""THEN635
640 L$=LEFT$(P$(N),2):R$=RIGHT$(
P$(N),1):L=VAL(L$):R=VAL(R$)
645 IF S=5 THEN M=RND(4):ONR GOT
O 650,655,660,665
650 IF M=1 THEN Q$(Q)=L$+S$(M)+R
$:CA(Q)=L+R:GOTO670
655 IF M=2 THEN Q$(Q)=STR$(VAL(L
$)+VAL(R$))+S$(M)+R$:CA(Q)=L:GOT
O670
660 IF M=3 THEN Q$(Q)=L$+S$(M)+R
$:CA(Q)=L*R:GOTO670
665 IF M=4 AND VAL(R$)<>0 THEN Q
$(Q)=STR$(VAL(R$)*VAL(L$))+S$(M)
+R$:CA(Q)=L:GOTO670 ELSE P$(N)="
":GOTO635
670 IF Q=INT(NQ/3)THENPRINT:PRIN
T:PRINT"   JUST RELAX...."
675 IF Q=INT(2*NQ/3)THENPRINT:PR
INT:PRINT"        ALMOST DONE NOW.
..."
680 R=0:P$(N)="":SOUND RND(255),
1:NEXT Q
685 '
700 '******DISPLAY QUESTION,CHEC
K ANSWER, TIME RESPONSE********
705 CLS
710 NW=0:POKE255,0:P=1471:D=2*NQ
*K
715 IF SW=1THEN PRINT@0,"TIME LE
FT: ";:PRINT@11,NQ*K;:PRINT@15,"
SECONDS"
720 IF CB=1THEN GOSUB1000
725 SOUND100,7:TIMER=0
730 FORQ=1TONQ
735 PRINT@234,Q$(Q)+" = "
740 A$=INKEY$:IF A$=""THEN GOSUB
15:GOTO740
745 PRINT@244,A$
746 A=VAL(A$):IFA=CA(Q)THEN760
750 B$=INKEY$:IFB$=""THEN GOSUB
15:GOTO750
755 PRINT@244,A$+B$:A=VAL(A$+B$)
760 IF A=CA(Q) THEN SOUND 100,1
ELSE NW=NW+1:NW$(NW)=Q$(Q)
765 PRINT@234,STRING$(10," "):NE
XTQ
770
800 '***DISPLAY RESULTS***
805 CLS:PRINT:PRINTN$:PRINT"YOU
DID "NQ"QUESTIONS.":PRINT"YOU GO
T "NQ-NW"RIGHT ":PRINT"OR "INT((
NQ-NW)*100/NQ)" PERCENT"
810 MIN=(INT(TIMER/60/60))
815 SEC=INT(TIMER/60)
820 PRINT" IN "MIN;
825 LEFTOVER=SEC-MIN*60
830 PRINT"MINUTES AND "LEFTOVER"
SECONDS."
835 IF SEC<NQ*K THENPRINT:PRINT"
YOU BEAT YOUR TARGET!" ELSEPRINT
"YOU WERE A LITTLE SLOW!"
840 IF NW>0 AND SEC<NQ*K THENPRI
NT"BUT MISTAKES WILL COST YOU!"
ELSE IF NW<NQ/2 AND SEC>NQ*K THE
```

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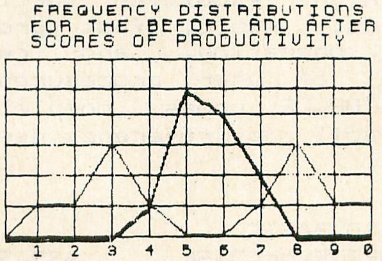

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```
NPRINT"BUT YOU GOT MOST OF THEM
RIGHT!"
845 PRINT"YOU ARE NOW RATED AS"
850 LEV=INT(SEC/NQ+.5):IF NW>0AN
D INT(NW*10/NQ)>1 THEN LEV=LEV+I
NT(NW*10/NQ)ELSE IF NW>0 THEN LE
V=LEV+1:'***SET CRITERION REFERE
NCE AT 100% - TO REDUCE, CHANGE
NW>0 TO NW>NQ*.XX WHERE XX IS DE
SIRED PASS PERCENT
855 IF SEC>NQ*K THEN LEV=LEV+1
860 IF LEV>6 THEN LEV=6
865 PRINTLEV" - "R$(LEV):POKE256
,LEV
870 GOSUB2000
875 '***LIST MISSED PROBLEMS***
880 IF NW=0THEN915
885 IF NW=1THENPRINT"HERE IS THE
 ONLY ONE YOU MISSED:" ELSE IF N
W>1THENPRINT"HERE ARE THE ONES Y
OU GOT WRONG:"
890 FOR X=1 TO NW
895 PRINTNW$(X)
900 IF X/10=INT(X/10)THEN 905 EL
SE IF X<NW THEN NEXT X ELSE GOSU
B2000:GOTO915
905 GOSUB2000
910 NEXTX:GOSUB2000
```

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```
915 CLS:PRINT@227,"PRESS <SPACE>
 TO GO AGAIN.":PRINT@259,"PRESS
<Q> TO QUIT."
920 A$=INKEY$:IFA$=""THEN920ELSE
IFA$="Q"THEN925ELSECLS:PRINT@230
,"JUST A MOMENT, "N$:GOTO200
925 END
930 '
999 '*****DRAW COLOR BAR*****
1000 FOR P=1408 TO 1437:GOSUB100
5:SOUNDP-1300,1:NEXTP:RETURN
1005 IF P>1423THENPOKEP,175
1010 IF P<1424 AND P>1412 THEN P
OKE P,159
1015 IF P>1408 AND P<1413 THEN P
OKE P,191
1020 RETURN
1999 '*****WAIT FOR USER*****
2000 PRINT:PRINT"    PRESS <SPA
CE> TO GO ON."
2005 A$=INKEY$:IF A$<>" "THEN200
5
2010 RETURN
2999 '***MAKE A JOYFUL SOUND***
3000 ' PUT YOUR FAVORITE SONGS O
R SOUNDS HERE
3999 '*****INSTRUCTIONS*****
4000 CLS:PRINT:PRINT:PRINT:PRINT
"SPEED MATH WILL TEST YOUR SKILL
 AND SPEED AT BASIC MATH FACTS."
4005 PRINT"WHEN YOU HEAR THIS SO
UND":PRINT"THE QUESTIONS WILL ST
ART.":GOSUB2000:SOUND200,7
4010 CLS:PRINT:PRINT@96,STRING$(
32,42):PRINT"   THAT'S THE START
ING SOUND."
4015 PRINT:PRINTSTRING$(32,42):G
OSUB2000
4020 CLS:PRINT"LET'S TRY ONE:":P
RINT:PRINT@234,"7 - 2 ="
4025 'PRINT@416,"TYPE THE ANSWER
. IF NOTHING    HAPPENS, PRESS
<SPACE>."
4030 A$=INKEY$:IF A$=""THEN4030
4035 PRINT@244,A$
4040 IF A$="5" THEN SOUND100,1:P
RINT@276,"right":GOTO4045ELSE PR
INT@276,"PRESS <5>":GOTO4030
4045 GOSUB2000
4050 CLS:PRINT:PRINT:PRINT:PRINT
: PRINT"     do not press <ENTER
>":PRINT"     AFTER YOUR ANSWER.
":PRINT:PRINT"IF YOU MAKE A MIST
AKE,DO NOT TRYTO FIX IT UP. JUST
 GO ON TO THE NEXT QUESTION.":PR
INT:PRINT"IF NOTHING SEEMS TO BE
 HAPPENINGPRESS <SPACE>."
4055 PRINT:PRINT"AFTER A GAME OR
 TWO, YOU'LL GET FASTER AT IT."
4060 GOSUB 2000:RETURN
```

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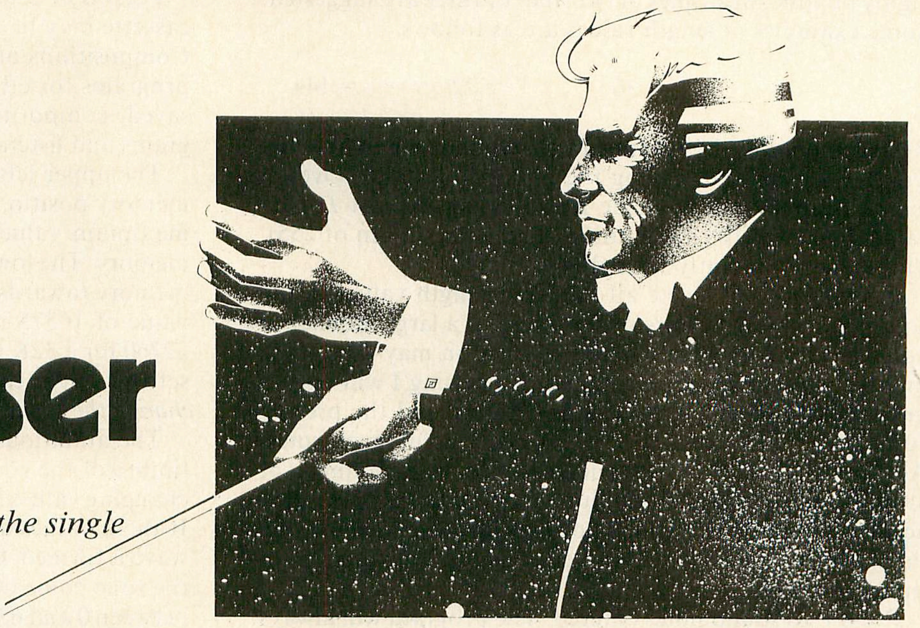


A program to let you break out of the single melody line limitations of BASIC.

By Larry Konecky

Have you ever felt frustrated by the limitations of the *SOUND* and *PLAY* commands provided by BASIC? Most of us interested in musical applications of computers would like to "play" with more than single melodic lines. Writing up to four part harmony is now possible on the Color Computer. This capability is provided by the following program.

A PCLEAR0 will need to be performed before loading and running the program. If a disk drive is not being used POKE 25,6 and POKE 31,6 to accomplish a PCLEAR 0. If disk drive is being used then POKE 25,14: POKE 26,1 and POKE 3584,0 before loading and running. With disk use *RUN* after loading, as ",R" after the *LOAD* command will not work with the above procedure for a PCLEAR 0.

The listing actually contains two separate programs. The BASIC program contains a machine level program which is poked into memory locations &H2A00 through &H2CA9. Also &H29C0 through &H29D6 are used as reserved spaces for variables. The BASIC program produces and gives control over a "window" which allows numbers to be poked into specific memory locations. These numbers are used to control pitches and lengths of notes to be played. The PCLEAR0 allows room for the machine program to reside above the BASIC program with enough memory left over for BASIC program modification and a piece of music of over 900 four-voice chords with 16K of RAM.

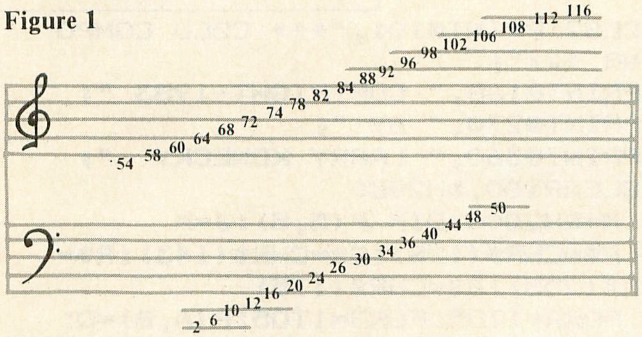
For an assembly listing of the machine program refer to the July issue of *Color Computer News,* 1982, Pages 16 and 17. The listing may also be found in the February issue of *'68' Micro Journal,* 1982, Pages 35 and 36. There are a few slight modifications to the object code as found in the above articles. Differences will be found in memory locations used and the added capability of entering your own musical compositions or other pieces. These programs are based on an algorithm published by Hal Chamberlin in the September 1977 issue of *Byte.*

After entering *RUN* wait a few moments while the machine program is poked into its proper location in memory. After this action has been completed a "window" will be displayed on the screen with labels indicating such items as number of column positions, length and voice placements, and key functions. Press any of the arrow keys to move a black cursor to the desired row or column position for entering digits. Pressing the left or right arrow keys with the cursor at the respective edge will move the window to a new memory location if lower or upper memory limits have not been reached.

Note pitches and lengths are all entered as numbers. To enter these numbers, first position the cursor, then press the space bar. A red cursor will replace the black cursor indicating that digits may now be entered. If a number entered is two digits or less, press E to regain the black cursor and ensure a proper entry. If a number is three digits long, the black cursor will reappear automatically. If a number value is above a preset limit (130 for pitches and 254 for lengths) it will need to be reentered. To edit or change any number just enter the new number over the old number following the above procedures. (Numbers are entered directly into RAM.)

All pitch values need to be even numbers. Refer to Figure

Figure 1



(Larry Konecky holds a master's degree in guitar performance and is working on a doctor of music education degree. He is currently Director of CAI in Music at Alcorn State University.)

1 for a chart indicating corresponding pitches and numbers on a grand staff. To enter sharps or flats, add or subtract a value of two from the selected pitch. Length values can be highly flexible. Multiples of two and/or three are suggested. Some examples of length values are as follows:

= 18 = 36 = 72 = 144

Rests are possible by placing a value (greater than 0) in the length position and leaving the pitch values at 0. Overall tempo changes can be made by adjusting the last *DATA* value in Line 5010 (minimum of 1 to a maximum of 255). This value is presently set at 104.

Pressing D will delete all note and length values in the column in which the cursor is residing. If a large number of notes has already been entered this action may take some time as memory spaces are adjusted. Pressing I will open a memory area between the column before and the present cursor position, allowing insertion of a column of notes. Again, this action may be delayed if a large number of memory spaces needs to be adjusted. Pressing J allows quick access to memory locations not presently being shown by the window. After J is pressed, enter the column number of the area desired.

Press P to sound notes entered. The program will always start at column 1 regardless of the cursor's position. After notes have been sounded the cursor will return to column 1. A zero in the length position will always cause the program to stop sounding notes ("the end").

Press S or L to save or load compositions. Either disk or cassette may be selected for the saving or loading process. Compositions are saved and loaded as machine language programs for efficient use of time and storage space. Once saved, compositions may be loaded as independent programs and listened to using the *EXEC* command.

The upper left-hand numbers on the window screen are memory position indicators. The top number indicates the maximum value to which the cursor has been moved in memory. The lower number indicates the present position in memory towards which the cursor is pointing. A maximum value of 16375 is possible in a 16K Color Computer and 32760 for a 32K Color Computer. The program is presently set for a 32K computer. *If a 16K computer is being used change the value in Line 350 from 32760 to 16375.*

The ambitious reader may want to experiment with the timbre of the sound being produced. This may be done by changing values in the Waveform Table (Lines 1000—1310). If these values are charted in graph form a modified sine wave is formed. Changing the shape of this wave will change the tone color of the sound being produced. Use numbers between 0 and 63, and make sure there are the same amount of numbers as listed (256).

NOTE: *A short arrangement taken from the Nutcracker Suite is included along with the Composer Program on Rainbow On Tape.*

		945	0D76
115	0210	1090	0F69
285	049B	1240	112B
400	0692	1490	1339
580	091E	4040	1589
761	0B28	END	1785

```
1 CLS2:PRINT@101,"*** COCO COMPO
SING ***";
2 PRINT@168," COPYRIGHT-1983 ";
3 PRINT@270," BY ";
4 PRINT@360," LARRY KONECKY  ";
5 CLEAR100,&H29C0
10 M=&H2D00:DIM P(5,5):J=M
20 P$=CHR$(128):C$=CHR$(143):R$=
CHR$(255):B$=CHR$(175)
25 FORA=1TO5:FORB=1TO5:P(A,B)=Q:
Q=Q+1:NEXTB,A
30 FORD=&H2A00 TO &H2B83:READT:P
OKED,T:NEXTD
40 FORD=&H2C00 TO &H2CA9:READP:P
OKED,P:NEXT
50 DEFUSR0=&H2C00
60 GOSUB500:Z=1:S=139:X=1:Y=1:M=
&H2D00
70 GOSUB400:PRINT@S,P$;
99 '* FUNCTION SELECT
100 PRINT@65,M;
101 IFPEEK(341)=247THEN250'UP
105 IFPEEK(342)=247THEN280'DOWN
110 IFPEEK(343)=247THEN320'LEFT
115 IFPEEK(344)=247THEN350'RIGHT
120 IFPEEK(338)=251THEN600'PLAY
125 IFPEEK(341)=251THEN625'SAVE
130 IFPEEK(342)=253THEN700'LOAD
131 IFPEEK(340)=253THEN900'JUMP
132 IFPEEK(339)=253THEN930'INSER
T
133 IFPEEK(342)=254THEN950'DELET
E
135 IFPEEK(345)=247THEN136ELSE10
0'SPACE BAR
136 PRINT@S,R$;:I$=INKEY$:I$=""
137 I$=INKEY$:IFI$=""THEN137
140 N=VAL(I$):C=0
150 PRINT@S,"    ";:PRINT@S,N;
155 FORT=1TO200:NEXTT
160 I$=INKEY$:IFI$=""THEN160ELSE
IFI$="E"THEN195
165 NN=VAL(I$)
175 N=N*10+NN:C=C+1
176 IFN>254THENN=0:GOTO136
180 IFN>130ANDX>1THENN=0:GOTO136
185 IFC=1THENPRINT@S,N;:GOTO160
195 PRINT@S,N;:PRINT@S,P$;:IFY=5
THENPRINT@S+4,B$;
200 POKEM,N:GOTO100
249 '* UP ARROW
250 IFX=1THEN100
255 X=X-1:PRINT@S,C$;:IFX=1THENS
=S-64ELSES=S-32
270 PRINT@S,P$;:M=M-1:GOTO100
279 '* DOWN ARROW
280 IFX=5THEN100
285 X=X+1:PRINT@S,C$;:IFX=2THENS
=S+64ELSES=S+32
```

```
300 PRINT@S,P$;:M=M+1:IFM>J THEN
J=M:PRINT@33,J;
310 GOTO100
319 '* LEFT ARROW
320 IFY=1 AND M<11525THEN100
325 IFY=1THEN340
330 Y=Y-1:PRINT@S,C$;:S=S-4:PRIN
T@S,P$;:M=M-5:GOTO100
340 Z=Z-1:M=M-(P(Y,X)+5):SS=S:S=
139:GOSUB400
345 S=SS:PRINT@S,P$;:M=M+P(Y,X):
GOTO100
349 '* RIGHT ARROW
350 IFY=5AND M>32760THEN100
355 IFY=5THEN380
360 Y=Y+1:PRINT@S,C$;:S=S+4:PRIN
T@S,P$;:M=M+5:IFM>J THENJ=M:PRIN
T@33,J;
370 GOTO100
380 Z=Z+1:M=M-(P(Y,X)-5):SS=S:S=
139:GOSUB400
385 S=SS:PRINT@S,P$;:M=M+P(Y,X):
IFM>J THENJ=M:PRINT@33,J;
390 GOTO100
399 '* WINDOW DISPLAY
400 PRINT@33,J;:PRINT@75,"
                ";
405 PRINT@75,RIGHT$(STR$(Z),3)"
";:PRINT@79,RIGHT$(STR$(Z+1),3)"
 ";:PRINT@83,RIGHT$(STR$(Z+2),3)
" ";:PRINT@87,RIGHT$(STR$(Z+3),3
)" ";:PRINT@91,RIGHT$(STR$(Z+4),
3)" ";:PRINT@95,B$+B$;
410 FORA=1TO5:FORB=1TO5
415 N=PEEK(M):IFN=255THENPOKEM,0
:GOTO415
420 PRINT@S,"    ";:PRINT@S,N;:M
=M+1:IFA=5THENPRINT@S+4,B$;
425 IFB=1THENS=S+64ELSES=S+32
430 IFB=5THENS=S-188
435 NEXTB,A:M=M-25:S=139:RETURN
499 '* WINDOW LABELS
500 CLS3:PRINT@12," *(E)NTER MUS
IC* ";
505 PRINT@44,"   (SPACE BAR)    "
;
510 PRINT@129," LENGTH   ";
520 PRINT@193," SOPRANO ";
530 PRINT@225," ALTO     ";
540 PRINT@257," TENOR   ";
550 PRINT@289," BASS     ";
560 PRINT@353," UP,DOWN,LEFT,OR
RIGHT ARROWS ";
570 PRINT@417," (P)LAY ";:PRINT@
428," (S)AVE ";:PRINT@439," (L)O
AD ";
575 PRINT@449," (J)UMP ";:PRINT@
460,"(I)NSERT";:PRINT@471,"(D)EL
ETE";
580 RETURN
```

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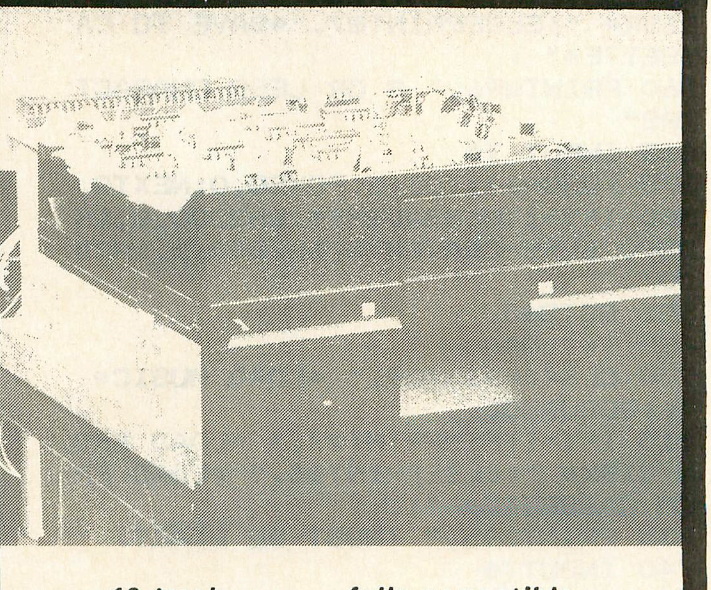

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```
599 'PLAY MUSIC
600 CLS0:C=USR(0):GOTO60
624 '* SAVE
625 CLS8:PRINT@9," *SAVE MUSIC*
";:GOSUB800
630 IFT=1THENPRINT@8," *SAVE TO
DISK* ";ELSEPRINT@7,"*SAVE TO CA
SSETTE*" ;
660 PRINT@96," 8 OR LESS CHARACT
ERS"
665 INPUT T$
675 FORQ=J+1TOJ+5:POKEQ,0:NEXTQ
680 IFT=1THENSAVEMT$,&H2D00,Q,&H
2D00 ELSE CSAVEMT$,&H2D00,Q,&H2D
00
685 GOTO60
699 '* LOAD
700 CLS4:PRINT@9," *LOAD MUSIC*
";:GOSUB800
710 IFT=1THENPRINT@7," *LOAD FRO
M DISK* ";ELSEPRINT@5," *LOAD FR
OM CASSETTE* ";
735 PRINT@96," (MUST BE EXACT) "
740 INPUTT$
750 IFT=1THEN LOADM T$ ELSE CLOA
DM T$
755 PRINT@199," WAIT ONE MOMENT
";
760 M=&H2D00
761 PE=PEEK(M):IFPE=0THENJ=M:GOT
O60
765 M=M+5:GOTO761
770 GOTO755
799 '* DISK OR CASSETTE
800 PRINT@64," SELECT (D)ISK OR
(C)ASSETTE":PRINT@98," PRESS SPA
CE BAR TO RETURN"
810 I$=INKEY$:IFI$=""THEN810
820 IFI$="D"THENT=1:GOTO850
835 IFI$="C"THENT=-1:GOTO850
840 IFI$=" "THEN60ELSE810
850 PRINT@64," ENTER TITLE:":RET
URN
899 '* JUMP
900 PRINT@12,R$" SELECT#       "
R$;:PRINT@22,;:INPUTZ
910 S=139:X=1:Y=1:M=(Z-1)*5+&H2D
00:
920 IFM>J THENJ=M
925 PRINT@12," *(E)NTER MUSIC* "
;B$+B$+B$;:GOTO70
929 '* INSERT
930 PRINT@S,R$+R$+R$+R$;:M=M-(X-
1):J=J+5:FORK=J TOM STEP-1:N=PEE
K(K):POKE(K+5),N:NEXTK:FORK=M TO
(M+4):POKEK,0:NEXTK
935 S=S-(X-1)*32:IFX>1THENS=S-32
940 X=1:M=M-P(Y,X):SS=S:S=139:GO
SUB400
945 M=M+P(Y,X):S=SS:PRINT@S,P$;:
GOTO100
949 '* DELETE
950 PRINT@S,R$+R$+R$+R$;:M=M-(X-
1):FORK=M TOJ:N=PEEK(K+5):POKEK,
N:NEXTK:J=J-5
960 S=S-(X-1)*32:IFX>1THENS=S-32
970 X=1:M=M-P(Y,X):SS=S:S=139:GO
SUB400
980 M=M+P(Y,X):S=SS:PRINT@S,P$;:
GOTO100
999 '*WAVEFORM TABLE
1000 DATA 13,14,15,17,18,20,21,2
2
1010 DATA 24,25,27,28,29,31,32,3
4
1020 DATA 35,38,39,41,42,43,45,4
6
1030 DATA 48,49,50,52,53,55,56,5
6
1040 DATA 57,59,59,60,60,62,62,6
2
1050 DATA 63,63,63,63,63,63,63,6
2
1060 DATA 62,62,60,60,59,59,57,5
6
1070 DATA 55,55,53,52,50,49,48,4
6
1080 DATA 46,45,43,42,41,39,38,3
6
1090 DATA 35,34,32,31,31,29,28,2
7
1100 DATA 27,25,25,24,24,22,22,2
1
1110 DATA 21,21,21,21,21,21,21,2
1
1120 DATA 21,21,21,21,22,22,22,2
4
1130 DATA 24,24,25,25,26,26,27,2
7
1140 DATA 27,28,28,30,31,31,32,3
2
1150 DATA 34,34,34,34,34,35,35,3
5
1160 DATA 35,35,35,35,34,34,34,3
4
1170 DATA 32,32,32,31,31,29,29,2
8
1180 DATA 28,27,25,25,24,22,21,2
1
1190 DATA 20,18,18,17,15,14,14,1
3
1200 DATA 11,11,10,08,08,07,07,0
6
1210 DATA 06,04,04,03,03,03,01,0
1
1220 DATA 01,01,01,01,00,00,00,0
0
1230 DATA 00,01,01,01,01,01,01,0
1
1240 DATA 03,03,03,03,03,04,04,0
```

```
4
1250 DATA 04,04,06,06,06,06,06,0
6
1260 DATA 06,06,07,07,07,07,07,0
7
1270 DATA 07,06,06,06,06,06,06,0
6
1280 DATA 06,06,04,04,04,04,04,0
4
1290 DATA 04,04,04,04,03,03,03,0
4
1300 DATA 04,04,04,04,04,06,06,0
6
1310 DATA 07,07,07,08,10,10,11,1
3
1399 '*NOTE TABLE
1400 DATA 0,0,2,111,2,148,2,187
1410 DATA 2,228,3,16,3,63,3,113
1420 DATA 3,165,3,220,4,23,4,86
1430 DATA 4,152,4,221,5,40,5,118
1440 DATA 5,201,6,33,6,127,6,226
1450 DATA 7,74,7,185,8,47,8,172
1460 DATA 9,48,9,187,10,80,10,23
7
1470 DATA 11,147,12,67,12,254,13
,196
1480 DATA 14,149,15,115,16,95,17
,88
1490 DATA 18,96,19,119,20,160,21
,218
1500 DATA 23,38,24,135,25,252,27
,136
1510 DATA 29,43,30,231,32,190,34
,176
1520 DATA 36,192,38,239,41,64,43
,180
1530 DATA 46,77,49,14,51,249,55,
16
1540 DATA 58,87,61,207,65,124,69
,96
1550 DATA 73,129,77,223,82,129,8
7,105
1560 DATA 92,155,98,29
2000 '*INITIALIZE
2010 DATA 134,63,183,255,35
2020 DATA 142,42,00
2030 DATA 191,41,195,191,41,198
2040 DATA 191,41,201,191,41,204
2050 DATA 142,45,0,191,41,192
2060 DATA 126,44,155
3000 '*READ LENGTH
3010 DATA 190,41,192,166,128
3020 DATA 183,41,194,57
4000 '*GET NOTES FROM TABLE
4010 DATA 49,141,254,214,166,128
4020 DATA 238,166,255,41,207,166
,128
4030 DATA 238,166,255,41,209,166
,128
4040 DATA 238,166,255,41,211,166
,128
4050 DATA 238,166,255,41,213
4060 DATA 191,41,192,57
5000 '*PLAY
5010 DATA 16,142,0,104
5020 DATA 166,159,41,195,171,159
,41,198
5030 DATA 169,159,41,201,169,159
,41,204
5040 DATA 183,255,32
5050 DATA 252,41,196,243,41,207,
253,41,196
5060 DATA 252,41,199,243,41,209,
253,41,199
5070 DATA 252,41,202,243,41,211,
253,41,202
5080 DATA 252,41,205,243,41,213,
253,41,205
5090 DATA 49,63,38,7
5100 DATA 122,41,194,39,12,32,18
6
5110 DATA 166,132,32,0
5120 DATA 32,0,32,0,32,180,57
6000 '*MAIN CONTROL
6010 DATA 23,255,127,129,0
6020 DATA 38,1,57
6030 DATA 23,255,128,141,162
6040 DATA 32,241
```

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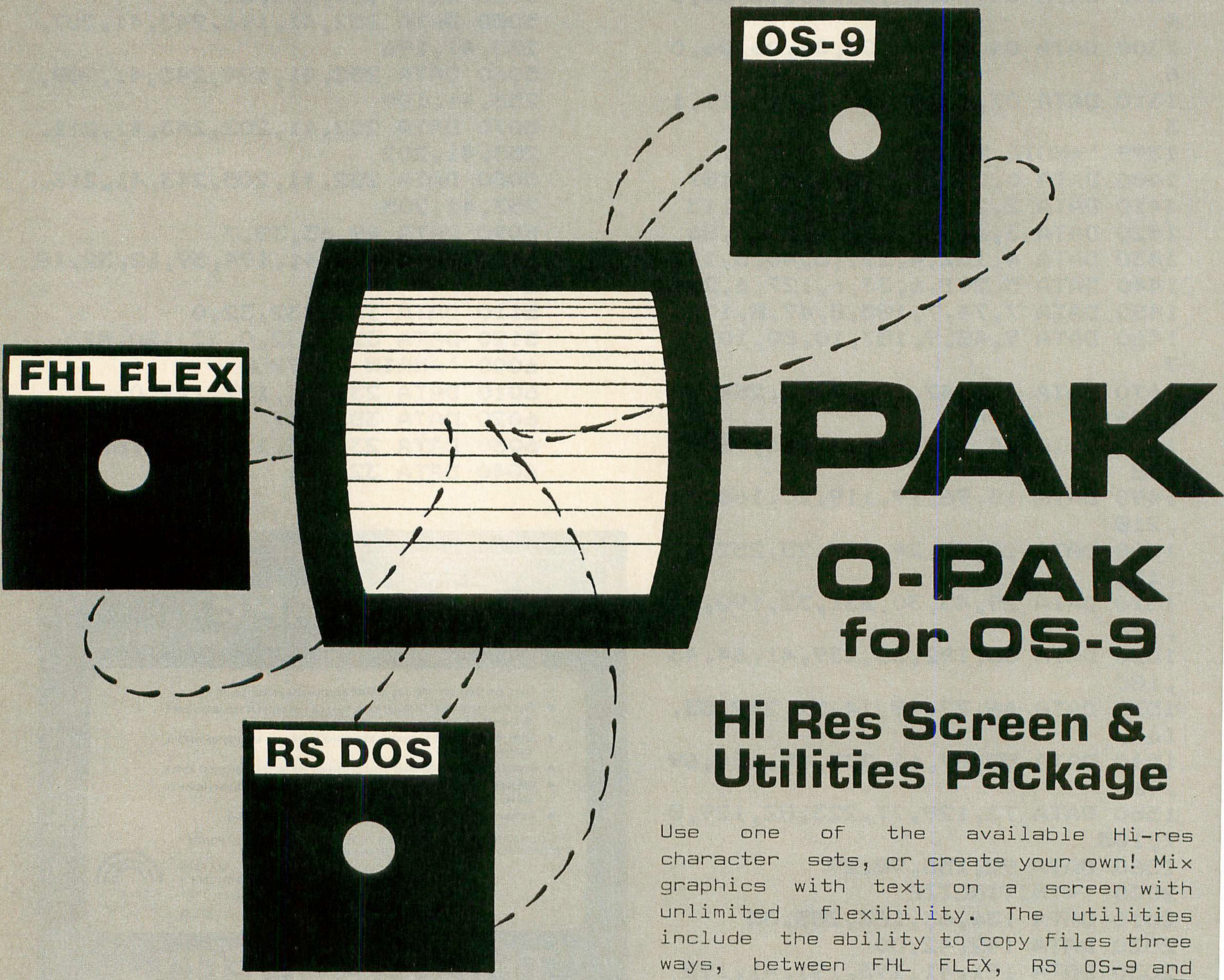

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Debugging Can Be Fun

By Joseph Kolar
Rainbow Contributing Editor

Keying in listings of promising programs that appear in *the Rainbow* is quite a chore — one approached reluctantly by many newcomers.

The good news is that it can be interesting and fun. In fact, copying listings found between the covers of *the Rainbow* is encouraged. It is a fine learning process. While in the process of keying in a listing, the mind is busily engaged in figuring out the significance of the program lines and how they fit into the program.

Think of it as a mental jigsaw puzzle. The program lines are pieces and you are trying to fit them together to make a complete picture.

We might as well develop a system to help us key in programs.

Anybody who types listings will make plenty of errors. This means the copied listing must be purged of all mistakes. You will make your share of them. You will have to debug your own work. Hold on! It isn't that bad! You will find that is the most satisfying part of the entire operation. Finding and correcting mistakes are good learning experiences.

The object is to make your copy of the listing identical to the original one. This means it must be copied exactly as published.

Rule one is to assume that the listing is correct as published and if you copy it exactly, it will perform as expected.

Before tickling the tiles, there are a few preparations to attend to.

Check the listing to see if your CoCo can handle it. Enough memory? Extended BASIC?

Put a blank, trial tape in the cassette recorder. Rewind to 000 and advance it to 010.

Get an overview. Look over the description of the program to familiarize yourself with it. After reading the text, read through the listing. Often you will come across lines and routines that ring a bell.

Now, tickle away! After you key in some lines, *RUN* and see if you get anything on the screen. Sometimes you will and sometimes you won't. You may get an SN Error message in some line. That's good! Correct it. Other error messages are likely to come up and we will consider them later.

One message you are likely to get is the UL Error in some line. It usually means that the computer is directed to some line you haven't reached yet. It is good to see the beginning of the program because it is often text or a graphic title. These are easy to touch up. Thus, you may put a temporary ' marker in front of the UL line and *RUN* to see if you get any display. If you do get a display, you will have to put some loop to hold the display, using numbers that are beyond the lines used: 20000 GOTO 20000. That way, if you do not remove it, it won't interfere with the program. Check it to see if it appears okay. For example, if it is a graphic square, is it distorted or incomplete? If so, look for the appropriate line and compare with the listing. You may have copied numbers wrong. The computer will not point to the mistake, but the unsatisfactory result will be one big hint.

Just remember to remove any temporary *REM* markers before continuing.

While you are still in the early part of the program, it is best to correct any errors. Later on, as more and more of your program is completed, it gets confusing to look for "up front" errors.

Let's assume that you are satisfied with your work thus far. *CSAVE* what you have keyed in. Make two copies. I call each temporary save one; two; etc., and keep a working list on a piece of paper on top of the computer between the air vents. Make a note of the name of the program. These simple names for temporary storage of a program in progress of being listed saves time dreaming up titles.

Every now and then, take a break. Make two copies of the work in progress. Frequent *CSAVEs* are insurance so that if the lights go out or you lose the program in memory, you won't have to go to square one and repeat your efforts.

When you complete the listing and *RUN* it, you will surely have some bugs in it. Before debugging your work, make two more *CSAVEs*. Then look at the program to see what error clues show up.

There is a good probability that you typed in incorrect numbers, variables, operators, (+, -, <, = etc.).

You will come to the point when you will have to *LIST* through the program and compare your screen lines with the original listing. One way is to *LIST* by increments: *LIST*—100 then *LIST* 100—200. Then, *LIST* 200—300; etc.

I don't like this forward-running system. There is a tendency to lose the lines on top of the screen display if the line group listed is lengthy. And, you know where all the mistakes are, don't you? They are always in the line you failed to check out.

I prefer to *LIST* to the end of the program and work backwards to the beginning. Note the program line number of the uppermost, complete line on the screen. Make a check

---

(Joseph Kolar is a free-lance writer and programmer dedicated to proselytizing for computers in general, and the CoCo specifically.)

mark next to this line number, in pencil, on the original listing. Compare the original and the lines shown on the screen. If it is okay, then *LIST* the number you checkmarked on the listing.

Again, checkmark the number of the topmost, complete program line on the screen. Compare, correct, and now proceed.

At first, there will be a slight delay as the program scrolls to the high line numbers. But, you will be systematically checking every line in the program.

As you verify each line, press [ENTER] so that the line you are currently checking is at the top of the screen.

If you find an error, correct it. Then *RUN* to see if it solved any problem. If the bug persists, you must *LIST* the highest line number appearing on the screen (same number you ticked off on the listing). Why? When you edited a line containing an error, the listing scrolled up, and some unverified lines were lost. It's better to be safe than sorry. So what, if you compare a set of lines twice?

An occasional SN Error message may be encountered as you *RUN* the program, because the SN line might not have been called and, thus encountered by the computer. Correct them as they appear.

After you correct a few mistakes, make a few more *CSAVEs*. It doesn't cost anything to make these trial saves.

Finally, after you zeroed in on that last bug, *RUN* the program a few times, trying out all of the options and check all of the possible results. When you feel you have a good program, make two more trial copies to tape. Then make two good copies on a permanent tape and list it in your "tape register" (discussed in the March 1983 issue). Only then erase your trial tape!

Do not anticipate the author of the listing. You may think you know better than he does. For instance, the author lists:

```
10 A$="R4; D1; F1; D4"
```

You say, "He could have listed it":

```
10 A$="R4D4F4"
```

True, he could have left out the spaces, omitted the semicolon and dropped the ones because no number defaults to one. However, the author wrote his listing so the inexperienced novice could read and understand the listing and he spaced between elements for easy legibility. Secondly, trouble is brewing when you make anticipatory changes when you are hunting down mistakes. The lines are not identical and you must read back and forth from the listing when comparing. It will slow down the process.

Don't combine lines to make multiple-line statements. You may cause yourself some grief.

Other common errors appear when you omit a line or lines, or if you omit one or more statements in a multiple statement program line.

Key in Listing 1. The object is to create a flashing rectangle in a flashing diamond in a flashing octagon.

Read and follow instructions in the *REM* lines at 170—220.

Key in Listing 2. Exactly, right? Errors and all! See if you can work out the errors.

Let me talk you through it. *RUN*. There is an SN Error in 10. Correct it and *RUN*. Next, there will be a UL Error in 95, so correct it by deleting the line or play it safe and put a ' marker in front of this line.

This error was inserted to demonstrate what could happen if you keyed in part of a program where a line called a line you didn't reach yet. *RUN*.

A diamond appears momentarily and then [OK]. This indicates the rectangle didn't show. Look for an error in that portion of the program. The solution is to take the ' marker out of Line 80 and *RUN* (FC Error in Line 80). It looks okay, so check lines that have A$ defined. The line is 20. Noting W is incorrect, change it to "D" and *RUN*. Note: If you left out BM in Line 80, you would also get an FC Error.

Now, you get the rectangle and the diamond, but they are not centered. Check both *DRAW* lines that print them to see which one is off. Correct it and *RUN*.

The rectangle and diamond are okay, but still no triangle. Check Line 130 that draws the triangle. It looks correct. You note in comparing your listing with the author's listing that Lines 140—160 are combined into Line 130 and Lines 140—160 are either ' or deleted. Copy the author's Lines 130—160. The error was that Line 70 directed the computer to go to Line 140. In our example, because we *REMmed* Lines 140—160, it went through them and stopped with an [OK]. If Lines 140—160 were deleted, a UL Error in 70 would be the result. Which says something about taking liberties with the author's listing. The solution is to copy the listings exactly and *RUN*.

The only trouble is that you still have no octagon. Look for the octagon shape variable and the line that draws it. In Line 60, D$ creates the octagon. Line 140 draws C$. Change Line 60 to C$ or change Line 140 to D$, if you insist on fooling with the listing. *RUN*.

Now, it is running properly.

This demo listing is a shortened version of a "real" listing. It gives you some clues on error messages and typing mis-

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takes you may make in the normal course of copying a listing.

Admit that it is interesting to debug your own copy of a listing. From now on, rather than shrink from the chore of keying in long listings, expect to have fun.

140 ____ 016B
190 ____ 036F
END ____ 0588

Listing 1:

```
0 'ERROR MESSAGE EXAMPLES. READ
REMS STARTING AT LINE 170 AND GO
THROUGH THEM ONE AT A TIME.
10 PMODE4,1:PCLS:SCREEN1,1
20 A$="R10D5L10U5"'RECTANGLE
30 GOTO 80
40 B$="E10F10G10H10"'DIAMOND
50 GOTO 110
60 C$="U10E10R10F10D10G10L10H10"
'OCTAGON
70 GOTO 140
80 DRAW"BM123,96"+A$
90 FOR X=1 TO 200:NEXT
100 GOTO40
110 DRAW"BM118,98"+B$
120 FOR X=1 TO 100:NEXT
130 GOTO 60
140 DRAW"BM113,103"+C$
150 FOR X= 1 TO 200:NEXT
160 GOTO 10
170 '***YOU CAN MAKE THE FOLLOW-
ING CHANGES TO CREATE ERROR
MESSAGES: DELETE 'P' IN <PMODE>
IN LINE 10.  <RUN>  CORRECT IT!

EXCHANGE A 'W' FOR THE 'D' IN
LINE 20.  <RUN>  CORRECT IT.
180 '***PUT A <'> IN FRONT OF
LINE 80 TO SIMULATE OMITTING A
PROGRAM LINE.  <RUN> AND NOTE
THE DISPLAY.  REMOVE <'>.
190 '***DELETE THE <$> IN LINE
140.  <RUN>  REPLACE <$>.

INSERT <95 GOTO 300>.  <RUN> DEL
ETE LINE 95.
200 '*** CHANGE EITHER '8' TO
'0' IN LINE 110 TO SIMULATE TYP-
ING AN INCORRECT NUMBER.  <RUN>
REPLACE '8'.

CHANGE THE <C$> IN LINE 60 TO
EITHER 'B$' OR 'D$'.  <RUN>  RE-
PLACE <C$>.
210 '*** SIMULATE A MULTI-STATE-
MENT ERROR BY CHANGING LINE 130
BY ADDING <:DRAW"BM113,103"+C$:F
OR X=1 TO 200:NEXT:GOTO 10>.
THEN PUT <'> IN FRONT OF LINES
140;150;160 TO SIMULATE DELETION
OF THOSE LINES. <RUN>.
220 '***DELETE WHAT YOU ADDED TO
LINE 130 AND REMOVE THE <'> FROM
LINES 140;150;160.
```

Listing 2:

```
10 MODE4,1:PCLS:SCREEN1,1
20 A$="R10W5L10U5"'RECTANGLE
30 GOTO 80
40 B$="E10F10G10H10"'DIAMOND
50 GOTO 110
60 D$="U10E10R10F10D10G10L10H10"
'OCTAGON
70 GOTO 140
80 'DRAW"BM123,96"+A$
90 FOR X=1 TO 200:NEXT
95 GOTO 300
100 GOTO40
110 DRAW"BM118,90"+B$
120 FOR X=1 TO 100:NEXT
130 GOTO 60:DRAW"BM113,103"+C$:F
OR X=1 TO 200:NEXT:GOTO10
140 'DRAW"BM113,103"+C
150 'FOR X=1 TO 200:NEXT
160 'GOTO 10
```

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BERT

Greetings!

Last month as you may recall, I did some various kinds of state-of-the-art art with *LOGO* on my Color Computer. Well, I don't know how it worked out with you, Dwight and Bea, but judging from the avalanche of letters I received, a lot of people liked it.

By the way, I should mention that I try to answer every letter I receive personally, but lately I've fallen behind (Apres le deluge, as the English say). Please be patient.

In any case, I put my art — my dogs, cats, and snakes — to the ultimate test. I showed them to Ben. Guess what? They failed the test.

Ben had hardly glanced at the screen when his eyes frosted over, and his lids slid down slowly over his frosted eyes like two awnings being unfurled in front of an ice cream shop on a sunny day. He groaned softly, let a long sigh of boredom curl out through the tunnels of his two nostrils, and promptly fell asleep — on my foot, no less!

All Woofensburgers are stubborn, and Uncle Bert is no exception. So I vowed to improve my art at least to the point where Ben wouldn't fall asleep instantly. Let me show you the results — and, by the way, you send me any ideas you have. I gave up entirely on the dog in the kennel with the fly buzzing around his nose; though that was pretty complete. In case you don't remember the cat and the snake, the following is how I did them last month:

```
TO CIRCLE2
  REPEAT 12 (FD 6 RT 30)
  END

TO CIRCLE3
  REPEAT 12 (FD 4 RT 30)
  END

TO CATEAR
  FD 17 RT 135 FD 11
  LT 90 FD 11
  RT 135 FD 17
  END

TO CATHEAD
  CIRCLE3
  CATEAR
  END

TO CATBODY
  PU LT 20 FD 10 PD
  CIRCLE2
  END

TO CATTAIL
  LT 20
  REPEAT 6 (FD 6 LT 30)
  END

TO CAT
  CATHEAD
  CATBODY
  CATTAIL
  END

TO CIRCLECAT
  PU BK 50 PD
  REPEAT 9 (CAT)
  END

TO CIRCLECAT2
  PU BK 60 PD
  REPEAT 10 (CAT RT 4)
  END
```

(W. Bert Woofensburger ("Uncle Bert") manages his own hog and corn farm near Ypsilanti, Mich. He has recently acquired a Color Computer and is learning LOGO. Woofensburger's editor and assistant, Dale Peterson, writes for a living, and his recent books include "Genesis II: Creation and Recreation with Computers" and "Intelligent Schoolhouse: Readings On Computers and Learning." He is currently working on a book about Color LOGO with Don Inman and Ramon Zamora, to be published in 1984.)

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```
TO CIRCLE4
    REPEAT 12 (FD 3 RT 30)
    END

TO SNAKEPOSITON
    PU RT 90 FD 10 LT 90 PD
    END

TO HALFCIRCLE
    REPEAT 6 (FD 4 RT 30)
    END

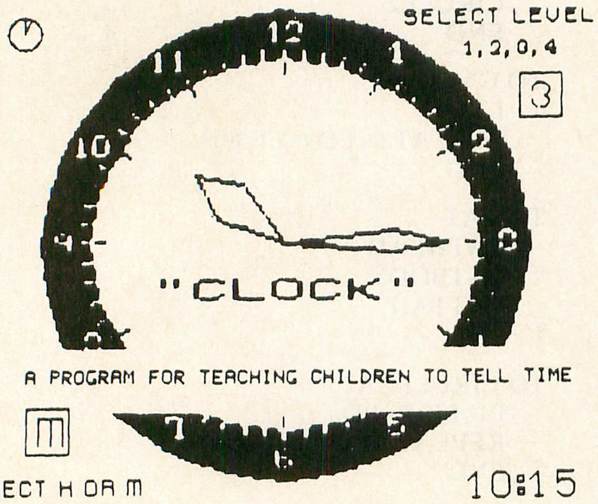
TO HALFCIRCLE2
    REPEAT 6 (FD 4 LT 30)
    END

TO BODY
    REPEAT 3 (HALFCIRCLE HALFCIRCLE2)
    END

TO SNAKE
    CIRCLE4
    SNAKEPOSITION
    BODY
    END

TO SNAKERETURN
    PU LT 90 FD 94 RT 90 PD
    END

TO SPINSNAKE
    REPEAT 10 (SNAKE SNAKERETURN LT 36)
    END
```



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```
TO SPINSNAKE2
    SNAKE HOME LT 36
    SNAKE HOME LT 72
    SNAKE HOME LT 108
    SNAKE HOME LT 144
    SNAKE HOME LT 180
    SNAKE HOME LT 216
    SNAKE HOME LT 252
    SNAKE HOME LT 288
    SNAKE HOME LT 324
    SNAKE HOME LT 360
    END
```

Now, the first thing I thought I would do was add a little flashing effect. I figured I could do that by inserting a *CLEAR* instruction here and there. With the *CIRCLCAT,* I did the following:

```
TO CIRCLECAT3
    PU BK 50 PD
    REPEAT 9 (CAT CLEAR)
    END
```

Not exactly the effect I was seeking. My idea had been to get the cat flashing on and off as it circled around — but as you can see, the first thing I discovered about the *CLEAR* command is that it sends the turtle back home. I mean, it clears everything; not just the picture. Back to the drawing board.

Well, I then remembered my *SPINSNAKE2*, which already had the turtle going home as part of its series of commands. So I simply substituted a *CLEAR* for every *HOME* in the *SPINSNAKE2*. I got something like this:

```
TO SPINSNAKES
    SNAKE CLEAR LT 36
    SNAKE CLEAR LT 72
    SNAKE CLEAR LT 108
    SNAKE CLEAR LT 144
    SNAKE CLEAR LT 180
    SNAKE CLEAR LT 216
    SNAKE CLEAR LT 252
    SNAKE CLEAR LT 288
    SNAKE CLEAR LT 324
    SNAKE CLEAR LT 360
    END

TO SPINSNAKE4
    REPEAT 4 (SPINSNAKE3)
    END
```

That was more or less neat, although I wanted it to go faster (like a real snake). There were a couple of things I thought of, as I watched *SPINSNAKE4* go through his or her paces. First of all, I realized I didn't need that final LT 360, since that just placed the turtle in the home direction; and *CLEAR* did the same. A minor matter.

Second, I thought maybe I would try a little color change, just to see what would happen.

So I tried this:

```
TO SPINSNAKES
    SNAKE PC 1 HOME LT 36
    SNAKE PC 2 HOME LT 72
    SNAKE PC 3 HOME LT 108
    SNAKE PC 0 HOME LT 144
    SNAKE PC 1 HOME LT 180
    SNAKE PC 2 HOME LT 216
```

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```
SNAKE PC 3 HOME LT 252
SNAKE PC 0 HOME LT 288
SNAKE PC 1 HOME LT 324
SNAKE PC 2 HOME
END
```

That didn't work so well, and I confess it took me a while to figure out why. Why? Blame it on that fresh little *HOME* command — not only does it wipe out position, but it seems to wipe out color.

Am I right? Fortunately, this seemed like a good place to practice my deleting with the editor (pressing *SHIFT* and left arrow at the same time). So I went down and deleted all the *PCs,* and put them so they followed instead of preceded the *HOME* command. After that, my program for SPINSNAKE5 looked like this:

```
TO SPINSNAKE5
   SNAKE HOME LT 36 PC 1
   SNAKE HOME LT 72 PC 2
   SNAKE HOME LT 108 PC 3
   SNAKE HOME LT 144 PC 0
   SNAKE HOME LT 180 PC 1
   SNAKE HOME LT 216 PC 2
   SNAKE HOME LT 252 PC 3
   SNAKE HOME LT 288 PC 0
   SNAKE HOME LT 324 PC 1
   SNAKE HOME PC 2
   END
```

I tried that and it wasn't very spectacular, but it became more spectacular when I learned to type *"COLORSET1"* in the *RUN* mode before starting anything. The results were beginning to be the kind of thing Ben might find interesting, although I wasn't quite ready to put it to the test. I did notice that whenever the pen color reached number 3 (*PC3*), it was the same color as the background, and so the turtle went through the motions but I couldn't see the results. I thought that might be a useful observation for later, but for now I decided to delete *PC3*. I went back over *SPINSNAKES* and changed the sequence of pencolors to 0, 1, 2, 0, 1, 2, and so on.

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I tried that. That was more interesting. Then I decided I liked pen color 1 the best. So I tried to do it all in that color. First, I began with this:

```
TO SPINSNAKE
   PC 1 SNAKE HOME LT 36
   SNAKE HOME LT 72
   SNAKE HOME LT 108
   SNAKE HOME LT 144
   SNAKE HOME LT 180
   SNAKE HOME LT 216
   SNAKE HOME LT 252
   SNAKE HOME LT 288
   SNAKE HOME LT 324
   SNAKE HOME
   END
```

But I quickly discovered once again (!!!) that every time the old turtle goes home he or she loses his or her old pencolor and has to be reminded once more. So, *SPINSNAKE6* wound up being like this:

```
TO SPINSNAKE6
   PC 1 SNAKE HOME LT 36
   PC 1 SNAKE HOME LT 72
   PC 1 SNAKE HOME LT 108
   PC 1 SNAKE HOME LT 144
   PC 1 SNAKE HOME LT 180
   PC 1 SNAKE HOME LT 216
   PC 1 SNAKE HOME LT 252
   PC 1 SNAKE HOME LT 288
   PC 1 SNAKE HOME LT 324
   PC 1 SNAKE HOME
   END
```

Next, I tried changing the background color a few times by doing this:

```
TO SPINSPIN
   BG 0 SPINSNAKE6
   BG 1 SPINSNAKE6
   BG 2 SPINSNAKE6
   BG 3 SPINSNAKE6
   END
```

That was fun; and as I already knew, when the background color shifted to the same color as the pen, everything went black. I decided to see if I could make the snake seem to erase itself, by playing with my two favorite pen colors. By that time I was sick of all that typing, however, so I reverted to an earlier and simpler version of *SPINSNAKE* that seemed not as nice, but was indeed easier to type. That version goes like this (with the two pen colors added):

```
TO SPINSNAKE7
   PC 1 REPEAT 10 (SNAKE SNAKERETURN
    LT 36)
   END
```

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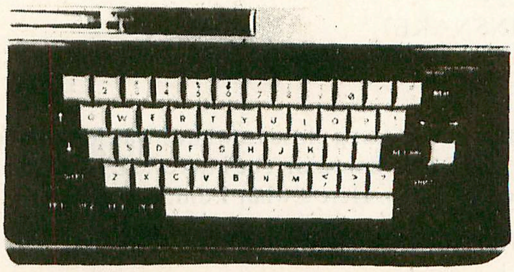

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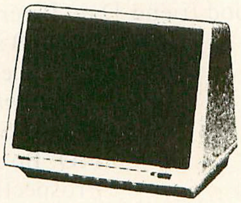

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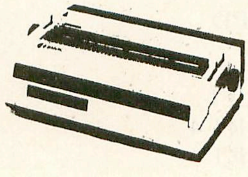

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```
TO SPINSNAKE8
   PC 2 REPEAT 10 (SNAKE SNAKERETURN
    LT 36)
   END
```

Then, I combined the two with a single background color, so it worked out like this:

```
TO SPINSPIN2
   BG 2
   SPINSNAKE7
   SPINSNAKE8
   END
```

Well, that was something close to what I was looking for — but I was still sure Ben wouldn't be interested. I decided to return to the cat image. Here's what I did with the cat:

```
TO CIRCLECAT3
   PC 1
   CIRCLECAT2
   END
```

But it didn't work out so well. It seemed that my hard won positioning of the cat on the screen was quickly cancelled by something, so that I kept getting a flashing cat in the middle of the screen. I thought and thought and thought and — at last a stroke of genius! — I realized I already had a *CIRCLECAT3* procedure (above), and the computer kept choosing that one because it was first in line. Close hand; make fist; strike head; begin again:

```
TO CIRCLECAT4
   PC 1
   CIRCLECAT2
   END
```

That worked just fine, and I went on to bigger and better things:

```
TO CIRCLECAT5
   REPEAT 10 (CAT RT 4)
   END

TO CIRCLECAT6
   CIRCLECAT4
   PC 2 CIRCLECAT5
   PC 3 CIRCLECAT5
   PC 0 CIRCLECAT5
   CLEAR
   END

TO SETCAT
   PU BK 60 PD
   END

TO CATCYCLE1
   PC 1 CAT RT 4
   PC 2 CAT RT 4
   END

TO CATCYCLE2
   PC 3 CAT RT 4
   PC 1 CAT RT 4
   END

TO CIRCLECAT7
   CIRCLECAT6
   SETCAT
   REPEAT 5 (CATCYCLE1)
   REPEAT 5 (CATCYCLE2)
   PC 3
   CIRCLECAT5
   PC 1
   CIRCLECAT5
   END
```

And just for good measure, I tried this variation:

```
TO CIRCLECAT8
   CIRCLECAT7 CLEAR
   BG 2 CIRCLECAT7 CLEAR
   BG 0 CIRCLECAT7
   END
```

Finally, I tried my hand at a little cubism (move over Pablo!):

```
TO CIRCLECAT9
   SETCAT
   REPEAT 20 (CIRCLECAT5 RT 90 FD 1 LT 90)
   END

TO CIRCLECAT5A
   PC 1 REPEAT 10 (CAT RT 4)
   END

TO CIRCLECAT5B
   PC 2 REPEAT 10 (CAT RT4)
   END

TO CIRCLECAT10
   SETCAT
   BG0
   REPEAT 10 (CIRCLECAT5A RT 90 FD 1 LT 90
   CIRCLECAT5B RT 90 FD 1 LT 90
   END
```

To be truthful, by the time I had reached *CIRCLECAT10*, I was a little tired of circles, snakes, and cats. Still and all, I resolved to try this last one out on Ben. What do you think happened? He just wasn't very interested. I thought about that one and realized I had to get his attention first.

Bertha has some Essence of Cat perfume. I put some of that around the screen, and definitely Ben was interested. I know that they have *LOGO*-style programs for composing music, as well as drawing pitures. The next step ought to be a *LOGO* of smells. I'll just toss that suggestion out there, and see if anyone wishes to pursue it. I remain,

Uncle Bert

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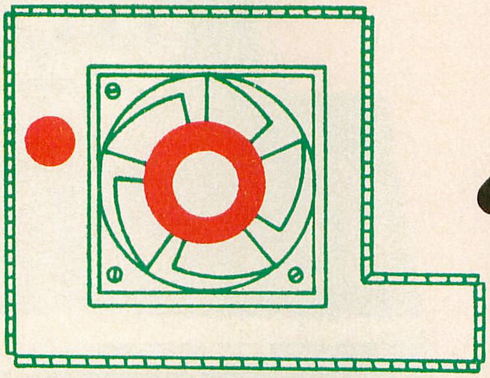

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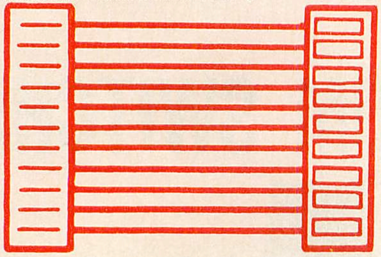

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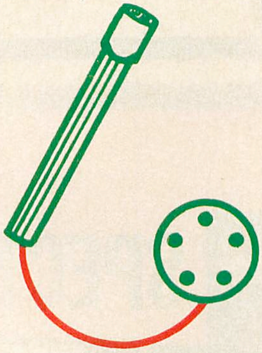

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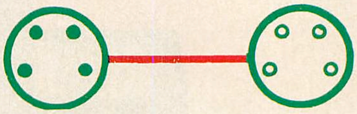

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HARDWARE REVIEW

ENTER THE DRAGON

By Fred Scerbo

As the TRS-80 Color Computer enters its third big year, it was only natural to expect that this powerful and popular home computer would spawn imitators or emulators. Tandy tried this route itself with the release of the TDP-100, only later to withdraw the model after finding out it was not feasible to compete with itself.

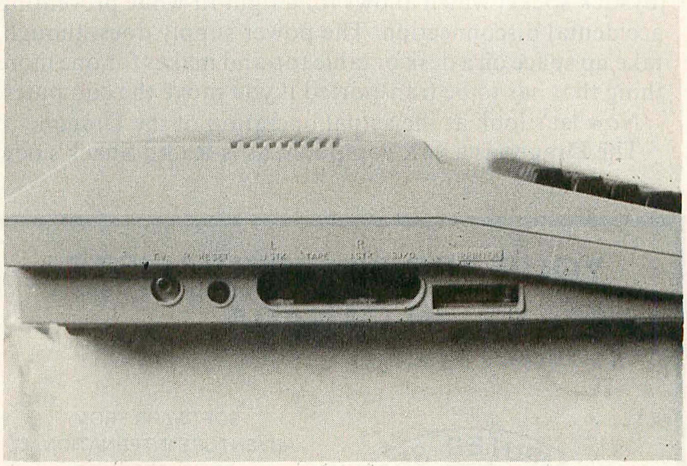
Well, the first real challenger to the CoCo's throne has finally arrived in the form of the Dragon by Tano, the U.S. version of the Microsoft Color Computer which has captured the British market, and if the initial evaluation models are any indication, then even the new 64K Color Computer has some competition in store.

I have long been a strong advocate of the Color Computer. However, working in the field of education has made it difficult to convince other educators that the CoCo, in its battleship silver, push-button case with a 32K BASIC memory, is much more than a toy, especially when compared to the more attractively cased but less powerful 48K Apple II. The new CoCo, of course, is packaged in a fawn gray case with multi-color, full-size keys.

The DRAGON keyboard has the same layout as the Color Computer yet uses a real touch-typist style keyboard. In the 48K mode, all keys become auto-repeat keys: a real plus when you want to edit.

(Fred Scerbo is a special needs instructor for the North Adams Public Schools. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.)

Well, it appears that the Dragon has solved both of these perceived weaknesses head on by placing a Color Computer clone under what is essentially an Apple II case and keyboard and jumping its 64K memory to allow for a full 48K while still in Extended Color BASIC. This simple cosmetic alteration and memory expansion makes the Dragon a competitor, not only in the home market, but in the fiercely competitive educational market as well.



The left side of the DRAGON includes the TV output, reset button, left and right joystick connections, Serial I/O, Tape I/O and, best of all, a parallel printer output.

Let us take a closer look at the Dragon's case first.

Physically, the Dragon is not as wide as the Color Computer, shaving about 2 inches off the width. This difference it makes up by adding a little over an inch in length. The case is much higher than the CoCo and has a much greater slope at the keyboard which has contoured keys that remain level in spite of the slope. The keyboard is very much like a Model III keyboard and is more suitable for touch typists than some of the CoCo replacement keyboards and even the new 64K Color Computer keyboard. The keys are gray with white characters, contrasting perfectly with the case's mocha-tan color.

The right-hand side of the case contains the ROM pack port, which does not have the CoCo's familiar swinging door. Instead, the port remains open in a rectangular tunnel which will prevent ROM packs or a disk interface from being improperly inserted. (No more pop goes the CPU!)

The left-hand side contains the majority of the most commonly used connections, including joysticks, tape I/O, serial I/O (RS 232), the TV RF output jack, the reset button and, best of all, a parallel printer output. This logical side placement of these devices is a welcome relief to anyone who has fumbled over trying to switch joystick connections or stabbed blindly for the reset button on a CoCo. Yet, it'll definitely give more "cord clutter" on the table top than does CoCo.

Only three devices appear on the very rear of the Dragon: the channel ¾ selector, a 5-pin DIN jack for a monitor connection, and the port for the transformer power supply. Since the power supply to the Dragon is an external supply, the Dragon weighs considerably less than the CoCo. What makes the external transformer so attractive in this case is the fact that it contains an ON/OFF switch on top of the transformer case. This is beneficial in two ways: first, the power switch can be placed in a location where it can be more easily accessed for a cold start and, secondly, the transformer does not draw power while plugged in though not in use like some other external units. The socket for the power supply on the Dragon case is identical to an Atari joystick socket which allows for a tight fit while preventing accidental disconnection. The power supply does, though, take up space on a desk or table top and makes for one more thing that has to be transported if you move the computer.

Now let's look at the actual operation of the Dragon.

The Dragon is a 64K computer, as is Radio Shack's new 64K CoCo. However, the Dragon allows the user to access a 48K memory from BASIC without loading in a machine language program to access the upper 32K.

A quick check of memory with a *PRINT MEM* command will show a *PCLEAR 4* memory of approximately 24K, just like the 32K and 64K CoCo. However, by typing *EXEC* and hitting [ENTER], the Dragon gets a super-memory charge and the available memory in BASIC is boosted to a whopping 48K. This is done by moving the ROM to the top of RAM. What is most amazing about this memory boost is that it does not destroy the program which may be resident in memory at the time, making it much like a *PCLEAR* command. All Extended BASIC commands remain intact, although some machine language programs would have to be rewritten to work in this memory. Also, the Dragon includes the new *PCLEAR* fix which avoids ?SN Errors after executing the *PCLEAR* command.

Screen layout and language commands remain virtually identical to the Color Computer. Some ROM calls are significantly different, although the alternate memory PEEK of 339 for joysticks appears to work on both computers. The BASIC tokens for the CoCo and the Dragon are very different, however, which means that programs saved on one will not load into the other unless they have been saved in ASCII. (While this technique is slow, it does allow communication between the two computers.) All programming tests which I conducted involved BASIC programs, and while I did not try any machine language programs, it is my understanding that these will be available almost immediately since the most popular programs have already been translated for the British market.

The unit, which sells for $399 comes packaged in a shock-resistant styrofoam packing. Included are the external power supply, the TV selector switch box, the TV connecting cable (RCA to RCA plug), and best of all, the cassette cable required to connect your Dragon to a standard cassette recorder. (Radio Shack's computer cassette recorder works nicely, as do a number of the moderately priced units.)

Also included is a thinnish 5" x 7" spiral bound tutorial book entitled "An Introduction to BASIC Programming Using the Dragon" by Richard Wadman. It appears that this handbook was written for the British market since most units are referred to in British pounds. The book covers the commands, but does not have the cartoon approach or the step-by-step learning lessons that Radio Shack's "Getting Started With Color BASIC" has. It appears to be easy reading for a fifth or sixth grader. The size of the handbook makes for easy reference and the inside cover includes an eight-fold Dragon Quick Reference Guide which can be removed for easy referencing.

In summary, I am hard-pressed to find fault with this offering from the Tano people. The only immediate drawback would appear to be the present lack of a disk system. However, this has been promised for the very near future and is not too great a shortcoming.

My Dragon has earned a permanent place next to my trusty Color Computer. (To be perfectly honest, my home unit is a TDP-100 while my classroom units are CoCos and MC-10s.) I can recommend it for serious consideration by both those who are looking for a first computer and those CoCo loyalists who want a second unit for any number of reasons.

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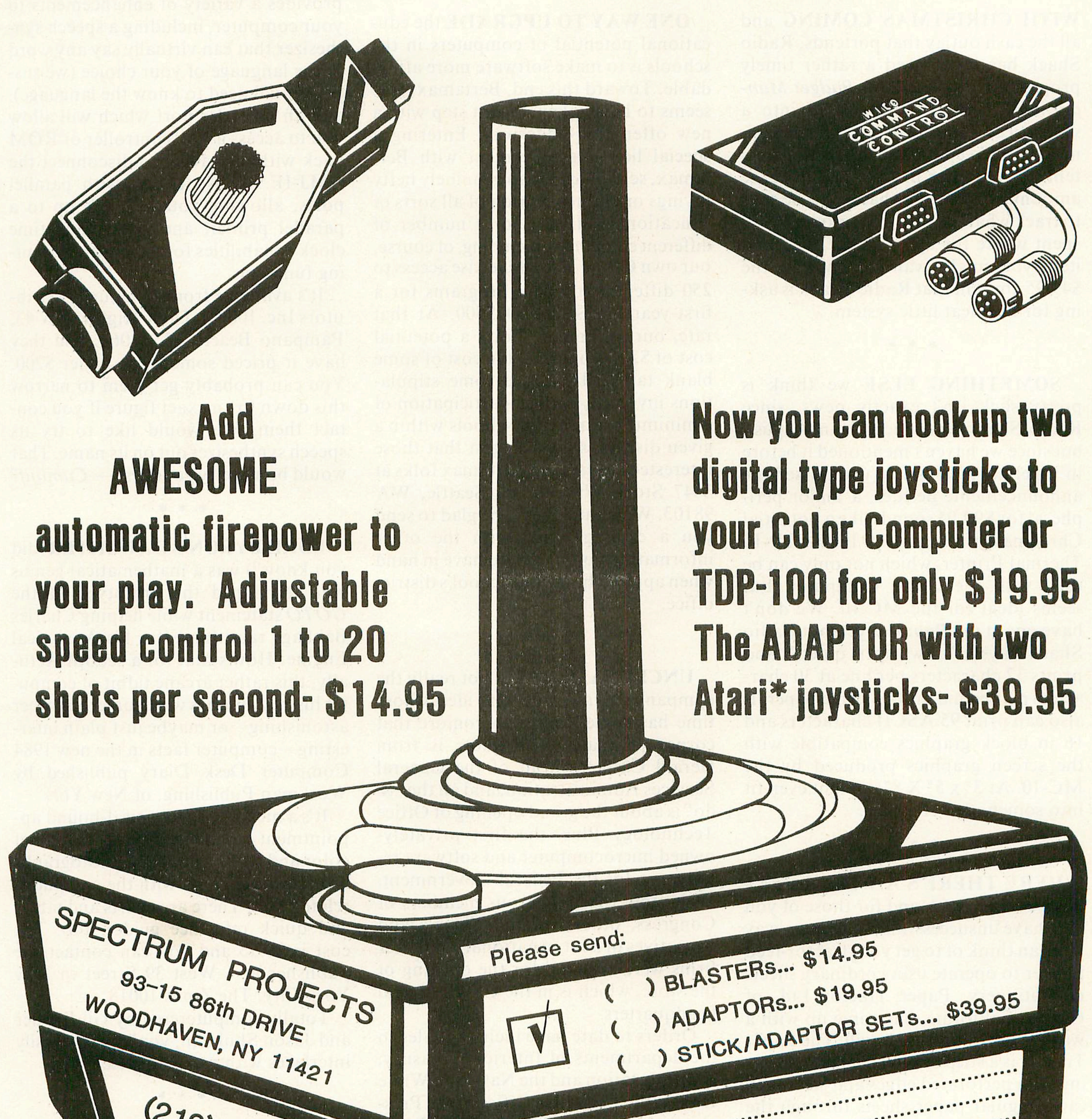

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PIPELINE

WITH CHRISTMAS COMING and all the cash outlay that portends, Radio Shack has introduced a rather timely program. It's called *Cash Budget Management,* and can turn CoCo into a sophisticated personal (or small business) bookkeeping and budgeting system. If you enter income and expense amounts on a regular basis, it'll be easy to track what money (what money?) you spent where for up to a year. The first item you might want to enter is the $49.95 amount that Radio Shack is asking for this neat little system.

* * *

SOMETHING ELSE we think is pretty slick isn't exactly news, since Radio Shack introduced it in August, but since we haven't mentioned it before in Pipeline, it's possible you missed the announcement. Besides, a major peripheral for $99.95 sounds like a potential Christmas gift. What is it? It's the TP-10 Thermal Printer, which not only can be used with the Color Computer, but seems ideal for the MC-10. We don't have one at *the Rainbow* yet, but Radio Shack says it's "whisper quiet," and prints 32 characters per line at 30 characters per second on 4-⅛" wide paper. It also can print 95 ASCII characters and 16 in block graphics compatible with the screen graphics produced by the MC-10. At 3" x 5" X 8" it might even fit into somebody's stocking.

* * *

WHERE THERE'S A WILL, there's a way, we once said, and for those of you who have unsuccessfully tried every way you can think of to get your tractor-feed printer to operate using ordinary sheets of stationery, Paper Tractor Ltd. of Goleta, California, has come up with a way so that your printer will. The Paper Tractor is a strip of pliable plastic sheeting with perforated edges and sleeves to carry regular paper sheets through the printer. For more information on this clever innovation, you can write to them at One South Fairview, Unit C, Goleta, CA 93117.

* * *

ONE WAY TO UPGRADE the educational potential of computers in the schools is to make software more affordable. Toward this end, Bertamax, Inc. seems to have taken a giant step with a new offer now underway. Entering a special licensing agreement with Bertamax, schools can reap genuinely hefty savings on the acquisition of all sorts of educational software for a number of different computers, including, of course, our own CoCo. They advertise access to 250 different software programs for a first-year license fee of $500. At that rate, our arithmetic shows a potential cost of $2 a program—the cost of some blank tapes! There are some stipulations involved, such as participation of a minimum number of schools within a given district, so we suggest that those interested contact the Bertamax folks at 3647 Stone Way North, Seattle, WA 98103. We're sure they'll be glad to send you a catalog along with the other information you'll want to have in hand when approaching your school's district office.

* * *

UNCLE SAMSOFT is not really the company's name, but "the idea whose time has come" seems to conjure that corporate image. The quote is from Gerald Carmen, head of the General Services Administration, and all the "to do" is about the grand opening of Office Technology Plus, the first privately-owned microcomputer and software retail store for the Federal Government. We're told that numerous members of Congress, other Federal officials and executives of a lot of national computer firms were on hand for the opening of the store, which is in the GSA's central headquarters.

Orders to date have included sales to the departments of Interior, Treasury, Transportation and the Navy, the White House, the Executive Office of the President, the Senate and the FBI. Right now, we're wondering two things: will the name "Office Technology Plus" fall to the tri-letteral acronymese of Washington shortspeak to be known as the OTP? And, will much of the software it sells be offered on red tape? Hmmm . . .

* * *

SPEAKING OF ACRONYMS, we're not sure if this is one or just a hard-to-pronounce word, but either way, CMJ-IF seems to be a distinctive new product for the Color Computer. Our information says that this multi-function subsystem plugs into the ROM port and provides a variety of enhancements to your computer, including a speech synthesizer that can virtually say any word in the language of your choice (we suspect you'll need to know the language), and an extender port which will allow you to access a disk controller or ROM pack without having to disconnect the CMJ-IF. It also comes with parallel ports, allowing you to hook up to a parallel printer, and it has real time clock capabilities for timing and counting functions.

It's available from Magnum Distributors Inc. 1000 S. Dixie Highway W #3, Pampano Beach, FL 33060, and they have it priced somewhere under $200. You can probably get them to narrow this down to an exact figure if you contact them. We would like to try its speech synthesizer out on its name. That would be a pretty good test — *Cumujif?*

* * *

LORD BYRON'S DAUGHTER (did you know?) was a mathematical genius who developed the prototype of the *GOTO* statement while helping Charles Babbage raise funds for his Analytical Engine. How's that for a scoop? Actually, this rather arcane tidbit of computer history appears with numerous other astonishing—or maybe just plain interesting—computer facts in the new 1984 Computer Desk Diary published by Workman Publishing, of New York.

It's a nicely created, spiral-bound appointment calendar that has loads of color and black and white photographs and drawings to go with the computer-related text. There are charts and tables and quick reference guides, too. The cost is $8.95 and you can contact the publisher at 1 West 39 Street in New York City. The Zip is 10018.

Totally computeresed by Gil Roeder and Jason Shulman, you'll find it easily interfaces with pen or pencil.

* * *

NEW SOFT WEAR available in time for Christmas is the Computer Tie from Tie-One-On of Philadelphia (P.O. Box 40225). It has computer terms woven into stripes. As far as we know, it doesn't come in a string variable.

* * *

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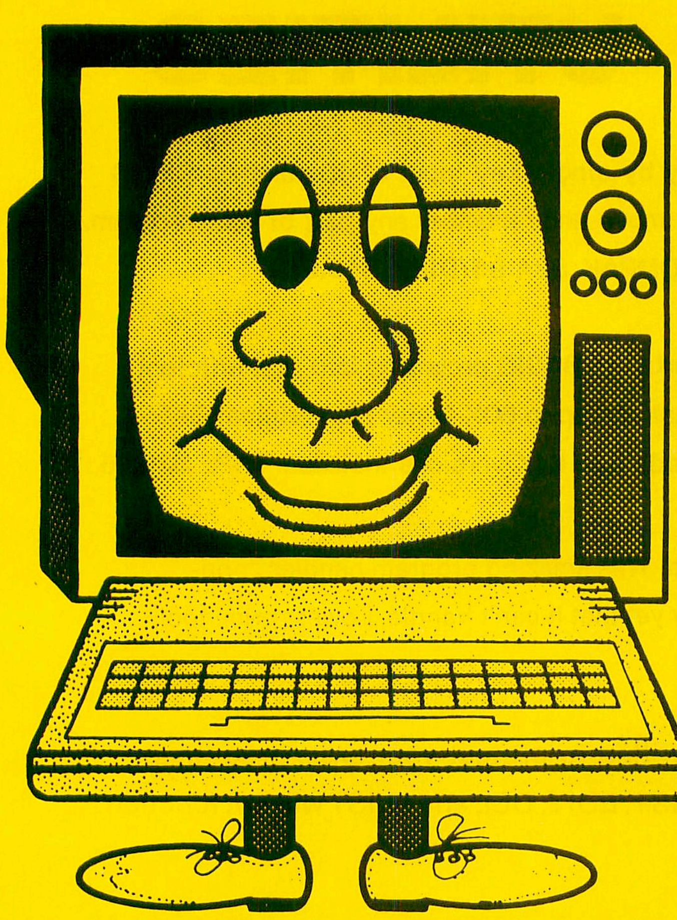

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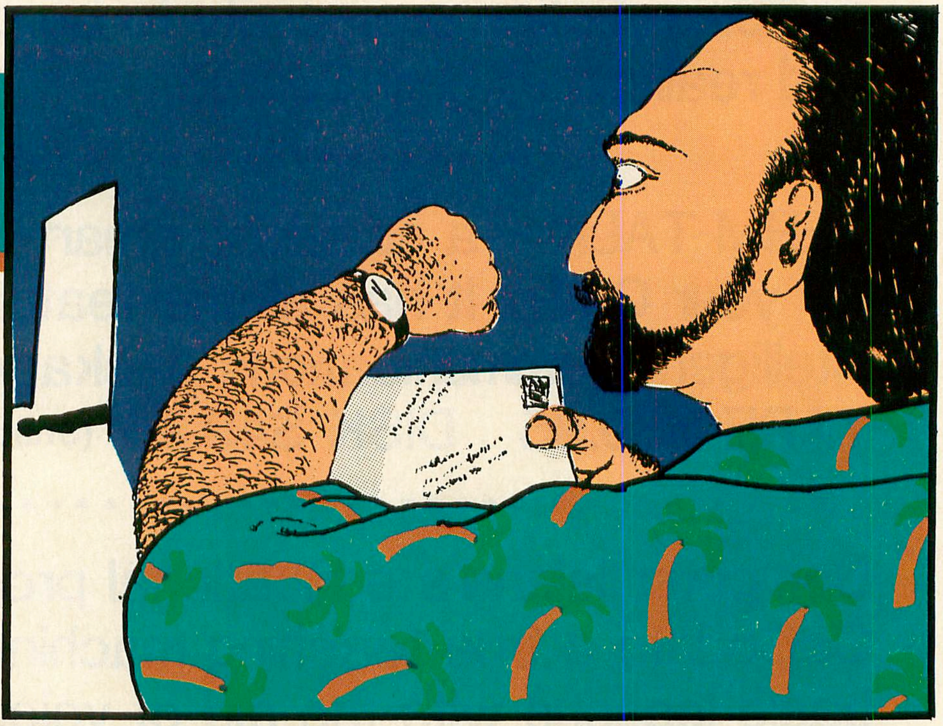
PRINTER UTILITY

4K

A FACE-SAVING ADDRESSOR FOR FRED

By Don Hughes and Jessie James



A friend of ours named Fred has one of the best CoCo set-ups we've seen. It's a 64K machine with two drives, a neat printer, and a 13-inch TV set he bought just to use with his computer!

Fred spends many happy hours at his upgraded keyboard.

Fred's collection of programs is just out of this world. It's a program reviewer's dream come true. Each month he rips through the pages of *the Rainbow,* checking out the ads, to see if there is something new he can acquire.

But something strange happened to Fred just last week. He was sitting at his keyboard with a big smile on his face, when his wife came into his study and said, "Honey, I have a little job for you. Will you address a few of these bill envelopes for me so I can get them off in the mail?"

Fred's eyes lit up. At last he would prove to his wife that his CoCo was more than a mere toy; more than a simple game machine. He would deftly sail through the task and triumphantly deliver the goods in record time!

To prove himself, all Fred had to do was address three envelopes including his return address. First, he looked into his vast arsenal of software. As his weapon, he chose his famous *Super Deluxe II* mail merge program, loaded it up, and swiftly scanned the main menu.

"Oh, oh," said Fred as he stroked his beard. "This program is great for custom letters and putting the addressee's name and address on the envelope, but I can't get my return address up in the corner."

Fred then decided to go for the heavyweight program, his *Super Hotdog 64 Wordblender*. He briskly keyed-in the information required on the envelopes, but suddenly found himself faced with a problem. He couldn't format the text so it would hit the envelope in the correct positions.

Fred recounted to us later that he thought maybe he was using too much of a heavy-duty program with the "Wordblender," so he decided to lighten-up and use his simple, but costly, screen format program.

About this time, his wife entered the room. She said, "Honey, are my three envelopes addressed yet?"

Fred had that big grin on his face again. He stuffed the first envelope into his printer and said, "Watch this." He started looking for the print key, but couldn't find it. He quickly checked the thick volume of documentation, but was chagrined to find that the particular edition of the

---

(Don Hughes, a writer and consultant, holds two master's degrees, one in education and the other in counseling. Jessie James has been engaged for the past 10 years in the electronic repair field. He is a bio-medical equipment technician at Kaiser Foundation Hospital in Fortana, Calif.)

program he owned did not have a printer output routine.

Fred was thinking how he could get his wife to leave the room for a few minutes as he clandestinely eyed her typewriter in the corner of the room.

How could Fred save face? How could he justify buying more hardware and software when, with all his fancy stuff, he couldn't get the addresses on three envelopes?

If Fred had had a copy of the simple program below, he could have saved the day. This program turns your CoCo into a typewriter, so all you have to do is type in your name and address, and the name and address of the person you're mailing the letter to, and . . . presto, a simple job is handled in an easy manner.

```
170.....01BF
END ...02D8
```

The listing:

```
10 ' ENVELOPE ADDRESSOR
20 ' BY JESSIE JAMES
30 ' AND DON HUGHES
40 ' (C) 1983 BY JESSIE JAMES
50 ' AND DON HUGHES
60 'THIS PROGRAM IS FOR LEGAL-
70 'SIZED ENVELOPES. TO USE
80 'WITH LETTER-SIZED CHANGE
90 'THE VALUE OF "S" IN LINE
100 '100 TO S=25.
110 CLS
120 POKE 150,18
130 PRINT@37,"ENVELOPE ADDRESSOR
":PRINT@97,"from:";
140 S=0:GOSUB 200
150 S=33:FOR X=1 TO 5:PRINT#-2,"
":NEXT X
160 CLS:PRINT@64,STRING$(32,195)
;
170 PRINT@37,"ENVELOPE ADDRESSOR
":PRINT@97," to:";
180 GOSUB 200
190 RUN
200 PRINT@64, STRING$(32,195);
210 FOR X=1 TO 4
220 PRINT@ X*32+133,"*";
230 LINE INPUT A$(X)
240 NEXT X
245 IF S=0 THEN PRINT@385,"posit
ion envelope in printer     press
 <ENTER> when ready";:INPUT C$
250 FOR X= 1 TO 4
260 PRINT#-2, STRING$(S," ");A$(
X)
270 NEXT X
280 IF S=0 THEN RETURN
290 FOR X= 1 TO 10
300 PRINT#-2
310 NEXT X
320 RETURN
```

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DISK UTILITY

32K
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KEEPING TRACK WITH *QUICK FIND*

By Paul Selig

This program is for the disk user who has accumulated so many programs it has become impossible to know where they all are. You can, of course, put each disk in the drive and do a *DIR* to get the directory for each disk, but to go through this for twenty or thirty disks can be a bit time consuming. This program, *Quick-Find Directory,* will produce an alphabetical listing of the contents of up to 10 disks. To aid in the reading of the listing, the format will be three columns by 55 lines. The advantage to this format is that all you must do is read down the columns to find your program instead of across, which is more time-consuming when you have a large list.

The program itself is very straight-forward, in a pseudo-structure format (the program goes from beginning to the end). The first few lines will print the heading on the screen and initialize the variables that are used in the program. The program will then proceed to ask you to put the disk in the drive and enter its number. After the number has been entered, the program will read the directory from the disk and add it to the array P$. After you type the word "END" or 10 disks have been read, the program will continue on and sort the array P$. The sort which this program uses is commonly known as a "shell" sort. I chose to put this sort in this program because it is well-suited for sorting a small number of elements (about 200-300), but will slow considerably when you get above 500 items. In this program, 250 items take about three minutes, while the maximum number of items, 680 (68 grans * 10), takes about an hour and a half.

This program uses some special codes to control the printer, as are commented in the listing. These codes are used for an Okidata 82A printer. If you have another printer, you will have to modify these CHR$ codes appropriately. If you are not using an eighty column printer, you must modify the print routine to work with it. This program also assumes a page length of 66 lines, and if your printer is different the program must be modified.

When you use this program, it will prompt you for the disk number. Place the disk in the drive and enter the number. In my disk library, I use a three-number coding technique. The first number is the *volume* number, and the second and third represent the number of the disk. For example, disk 412 is a disk from volume 4, disk number 12. Of course, you can use any format you like, including just the plain disk number. After the disk directory has been read, the program will prompt you to place the next one in the drive. One precaution I must mention is that if your disks have many filenames in the directory, the disk may stop and the computer will process the information, and then will continue to read from the disk. In other words, DO NOT remove the disk from the drive until you hear the tone from the speaker, or else you might cause an error and you will have to start over. Also, if you read 10 disks, the program will print the message "10 DISKS READ" and move on to the sort routine. You can play around with this value, but remember it is set to read 10 disks of 68 files each (very unlikely).

One thing which might interest some of you is the way in which I achieved the three-column printout. Since I know that there are 55 lines to be printed (not counting the header), and there are three columns, there will be a total of 165 filenames on each page. If there are more than 165 filenames to be printed, the computer will do a form-feed and the next page will be printed. However, to keep things neat, the sort program will put all the null strings at the end of the list, so that when you print out, the columns will go down until there are no more items, and the rest of that column will be blank. It is hard to explain, so you should really try it for yourself. The printing is done by keeping track of what page you are on, and by setting it to zero for the first page, one for the second, etc., and multiplying this number by 165, you will be able to print out all of the filenames using one *FOR-NEXT* loop.

(Paul Selig, Jr. is a junior in high school and president of the Westshore TRS-80 Users Group and the Cleveland CoConuts. He is also the sysop of the Westshore TRS-80 Users Group Bulletin Board System which can be reached at (216) 333-0574, 24 hours a day.)

230.....0291
460.... 04A4
END....0755

The listing:

```
10 'QUICK-REFERENCE DIRECTORY
20 ' BY: PAUL SELIG, JR.
```

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```
30 '
40 ' INITIALIZE
50 'VARIABLE LIST
60 ' PC=# OF FILENAMES READ
70 ' P1$=FILENAME WITHOUT DISK #
80 ' Z$=CURRENT DISK #
90 ' PP$=TEMPORARY STORAGE
100 ' P=CURRENT PAGE
110 ' TC=NUMBER OF DISKS READ
120 PCLEAR1:CLEAR18000:DIMP$(736
):PC=0:TC=0
130 CLS:PRINTSTRING$(32,172);CHR
$(128);"  QUICK REFERENCE DIRECT
ORY   ";CHR$(128);STRING$(32,163
);
140 PRINTSTRING$(64,128)
150 IF TC=10 THEN PRINT"10 DISKS
 READ!":FORX=1TO1000:NEXTX:GOTO3
60
160 SOUND1,1:LINEINPUT"MOUNT DIS
K IN DRIVE '0' & ENTER THE DISK
NUMBER: ";Z$
170 TC=TC+1
180 IFZ$="END" THEN 360
190 'READ IN THE DIRECTORY
200 FORS=3TO11
210 DSKI$0,17,S,A$,B$
220 FORX=1TO128 STEP 32
230 P1$=MID$(A$,X,12):GOSUB300
240 NEXTX
250 FORX=1TO128 STEP 32
260 P1$=MID$(B$,X,12):GOSUB300
270 NEXTX
280 NEXTS
290 GOTO150
300 IFLEFT$(P1$,1)=CHR$(255)THEN
 150
310 IFLEFT$(P1$,1)=CHR$(0)THENRE
TURN
320 P1$=LEFT$(P1$,8)+"."+MID$(P1
$,9,12)+"  "+Z$
330 P$(PC)=P1$:PC=PC+1
340 RETURN
350 'SORT THE ARRAY P$()
360 CLS0:B=1
370 B=2*B:IFB<=(PC-1) THEN 370
380 B=INT(B/2):IFB=0THEN450
390 FORI=1TO(PC-1)-B:C=I
400 'NOTE: ENTER lowercase USING
 THE SHIFT-0!!
410 D=C+B:IFP$(C)<=P$(D)THEN440
420 PRINT@0,"sorting";
430 PP$=P$(C):P$(C)=P$(D):P$(D)=
PP$:C=C-B:IFC>0THEN410
440 NEXTI:GOTO380
450 SOUND1,20:CLS0
460 PRINT@0,"sort";CHR$(128);"co
mplete";:FORX=1TO1000:NEXTX
470 CLS:PRINT"BE SURE PRINTER IS
 CONNECTED,  SELECTED, AND TURN
ED ON. WHEN  READY, HIT THE [EN
TER] KEY":PRINT:PRINT
480 LINEINPUTA$
490 CLS0:PRINT@0,"printing";
500 FORP=0 TO 4
510 'CHR$(31) IS THE EXPANDED
 PRINT (40 CHARS/LINE) MODE
520 'CHR$(30) IS THE RETURN TO
 NORMAL CODE
530 PRINT#-2,CHR$(31)TAB(12)"QUI
CK-FIND DIRECTORY"CHR$(30)
540 PRINT#-2,""
550 PRINT#-2,"FILENAME.EXT  DISK
"TAB(31)"FILENAME.EXT  DISK"TAB(
62)"FILENAME.EXT  DISK"
560 PRINT#-2,"------------  ----
"TAB(31)"------------  ----"TAB(
62)"------------------"
570 'PRINT THE DATA IN A THREE
 COLUMN FORMAT
580 FORX=0+(P*165) TO 54+(P*165)
590 PRINT#-2,P$(X),P$(X+55),P$(X
+110)
600 IF PC<X THEN RUN
610 NEXTX
620 'CHR$(12) IS THE FORM FEED
 CHARACTER
630 PRINT#-2,CHR$(12)
640 NEXTP
```

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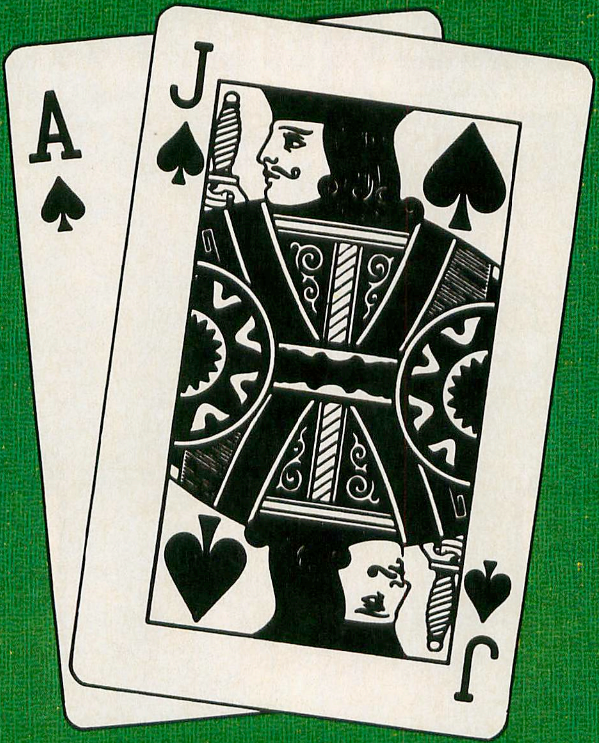
BLACKJACKPRO



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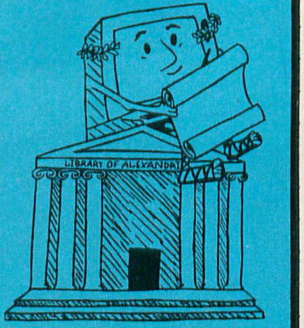
Putting A Little History In Your Future

By Michael Plog, Ph.D.
Rainbow Contributing Editor

Most people involved with education are forward looking. They look toward the future with expectation and anticipation. And with good reason; they know that computers are not fads in the schools.

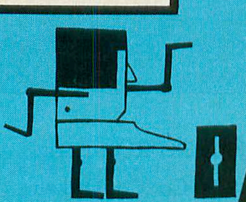
For the moment however, let's look backward — not into the future, but into the past. Way, far back.

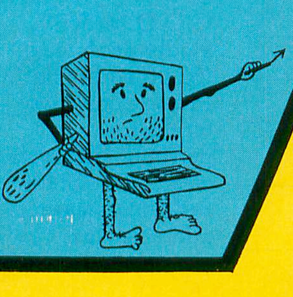
Consider the Library at Alexandria! The Greek general, Alexander the Great, built the city of Alexandria in Egypt in 332 B.C. The Ptolemys were Greek kings who inherited the Egyptian part of the empire of Alexander the Great. They constructed and supported the Library. For seven centuries the Library was the center of all learning in the Western world, as well as the publishing center for the entire world. For instance, the Old Testament comes to us primarily from the Greek translations made in the Alexandrian Library. Seven centuries, by the way, is a very long time. The United States in only a little over two centuries old.

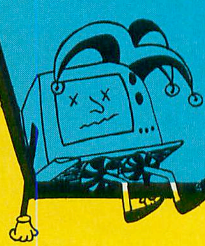


The Library, at its peak, held more than a half-million volumes. That is respectable for most libraries today, and totally outstanding when you consider that at the time, there were no printing presses, Color Computers, or even typewriters. All documents were copied by hand on papyrus scrolls.

But the Ptolemys did more than just collect information and books. They supported — with money and encouragement — scientific research; they helped create new knowledge. Eratosthenes studied and worked at Alexandria. He calculated the shape and size of the world, and his work was more accurate than the information available to Columbus! Euclid worked and wrote about geometry. His textbook was used for twenty-three centuries. There were many scholars at the library, making contributions in all fields of learning—astronomy, literature, mathematics, medicine, politics, and even atomic the-



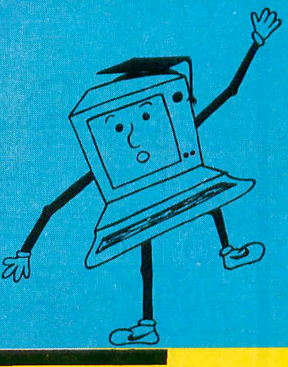


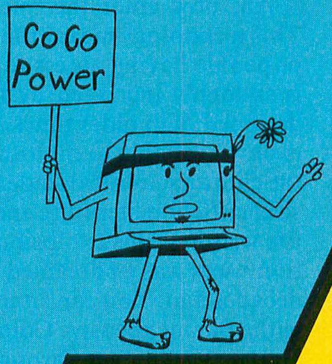


ory that led to the study of electrons and the eventual development of the computer.

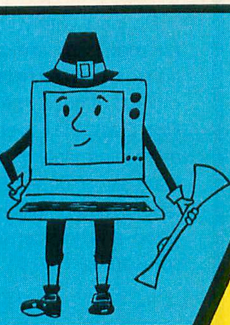
Today, nothing of the great Library but third-hand writings exist. The Library was destroyed in 415 A.D. I do not know all the reasons for the destruction. My thoughts and theories on the topic are unimportant. Just consider the Library as a symbol of learning for the ancient world.

The period from about 500 A.D. to the Renaissance (about 1500 A.D.) is known as the "Dark Ages." And with good reason. Science, technology, and learning in general stagnated during this time. Living conditions were poorer in Europe than existed centuries before in Greece and Egypt. Superstition, not science, ruled in Europe, for the elite as well as for the less affluent. The advancement of the human race was halted.





It is incorrect, of course, to blame the entire Dark Ages on the myopia of those people who fought against the Library of Alexandria. Conditions were many years in the making, and the fall of the Library was only one (although major) step in the supression of ideas. Those aborted ideas could have hastened the advancement of civilization. Just think—without the stupidity of European leaders during this time, we could have had our Color Computer a millienum earlier!

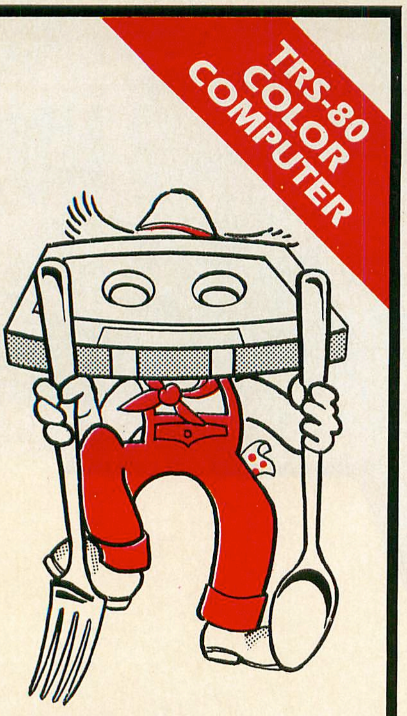


Come back to the present with me now. The excursion into the past may be interesting, but of what value is such a consideration for today?

It is entirely possible that the world, or at least our part of it, could be forced into another Dark Ages. Only the next one may last longer than just 1000 years. I cannot name the minds of those who would conspire for the death of free ideas. I do not know whose hands would tie the strangulation knot on inquiry. I do, however, know what the rope would look like. The last step in the creation of our next Dark Ages would be the forceful resistance to, and suppression of, exchange of information.

This is where the computer comes in. The computer can be—indeed should be—a tool to fight suppression, to be used for expansion and sharing of ideas. People use computers to write and store information about work they are doing, new ideas, new techniques they are developing. In many scientific fields of inquiry, advancement of knowledge has been increased dramatically because of the assistance provided by the computer.

(Michael Plog received his Ph.D. degree from the University of Illinois, the M.S. from Memphis State University, and the B.S. from the University of Tennessee. For his foreign/research language option required for the doctorate, he naturally selected computer language. Michael currently works for the Illinois State Board of Education as a research and evaluation specialist.)



TOOLS

Programs that make it easy to exploit the power and beauty of your Color Computer without making it hard on your wallet:

Graphics #1 - Displays and text delightfully manipulated! Watch and use First Cover, Drawer (the best drawing program anywhere), Graphtext (puts text on the graphics screen), Smalltext, Rotate (create and spin 3D objects in real time), World Map, 3D World, Star Map, String Art, Kaleidoscope, and Display Demo (text screen wizardry)!

Utilities #1 - Programming is simpler when you use Lister, Listmod, Newtrace (a better TRON), Lazkey (define keys as phrases), Append (easily combine two BASIC programs), BASIC Map, Varmap, Deleter, and CK Monitor (look at and modify memory).

Disk Utilities #1 - Harness the hidden powers of your disk system with Disk Edit (change things on disk directly), Disk Aid, Offset (EXECs most tape-only programs), Track Lock, DIR Save/Get (foil I/O errors), Cataloger, Master Catalog (keep track of your program library), and File Copy (a better BACKUP).

Choose any one of the three packages for just $12.00 ($17.00 on disk)!

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- a lot of software for a little silver

See your dealer or:
Write or call us direct at P.O. Box 21101,
Santa Barbara CA 93121 (805) 966-1449

As with any tool, negative applications are as possible as positive. Mainframe computers have been used to violate rights of privacy and restrict communication. It is easy for those in charge of the large data bases on mainframes to subvert the law and use the massive amounts of information for less than noble purposes.

Ah, now enter the microcomputer. This technology means that the number of people having access to information is suddenly increased by factors never dreamed of in older times. Information is now available to multitudes, not just the elite and political leaders. Outside of science fiction literature and some futurists writings, this explosion of information users was undreamed of just a few decades ago. You can sit in your home, with your inexpensive Color Computer, and make contact through a modem with people all over the country. You can purchase software for your Color Computer on almost any field you want. Just glance through the advertisements and articles in this issue of *the Rainbow*, and see how many tapes of topics you can learn about.

The microcomputer is not the cause of our present ability to learn about anything we wish; it is, however, the means to help us in our individual pursuit of learning about things of personal interest.

One other point should be made about the Library at Alexandria. The information stored and produced there was never shared outside a small, priviledged group of people. The information was never popularized to improve working and living conditions. In fact, information was considered dangerous in the wrong hands.

One of the products of the evolution of the American educational system is the concept of universal literacy. One of the outcomes of microcomputer technology is the ability for a single individual to collect and store large amounts of knowledge with little cost. Because of the power for the price, I prefer the Color Computer over any other; I assume you share this opinion, because you are reading this particular magazine.

This means that every home with a microcomputer can have their own slice of a library as great as the Library at Alexandria. The Dark Ages may not come after all. Your responsibility is to keep learning—education should never end with schooling.

Radio Shack
Color Computer
TDP System 100

ROAR!

Do tricks with your computer without breaking your wallet's spirit! A subscription to **Chromasette** gets you a tape or disk full of quality programs delivered by First Class Mail every month! Write for more information or, better yet, try a Back Issue. At $6.00 for 6 to 8 programs on tape ($11.00 on disk), you'll see just how good and inexpensive **Chromasette** software is.

The Bottom Line:	**Tape**	**Disk**
1 year (12 issues)	$50.00	$95.00
6 months (6 issues)	$30.00	$55.00
Single Issues	$ 6.00	$11.00

Calif. residents add 6% to single issues. First Class postage to N. Amer. included. Overseas add $10 to subscriptions and $1 to single issues. Sent AO rate. All back issues from July 1981 available—ask for list. Programs are for the Extended BASIC model and occasionally for disks.

Chromasette
Magazine

Chromasette
P.O. Box 1087 Santa Barbara, CA 93102
(805) 963-1066

A Super-Organizer For Your Tape Files

By Richard T. Meuse

There are many good tape directory programs available today. Some do this and some do that, but I was in need of a directory that was flexible. I wanted one that could be added to as the programs came along. One that would not change in size as programs were added or changed. One that would automatically load the program so you didn't have to stay with the computer until it loaded. I came up with the following program after several attempts. After trying it out with many friends in our local users group, I decided to share it with you.

As the program is shown, in lines 160 thru 250, the (1)XXXXXXXX will be replaced by the name of the program you will have as the first program after *TAPE—DIR* on your cassette. If the name of any of your programs are not eight characters long, still use all of the Xs, substitute SPACES for the Xs not used; that is, if your first program is named "DIZZY" let's say, you would replace the Xs like so. (1)DIZZY   , note three blank spaces after the Y in DIZZY. You would also have to change the Xs in line 390 to: CLOAD "DIZZY   "

The reason for the spaces is to keep the program length the same no matter when you add a new program to the tape. There are advantages to having 10 programs all ready to program into the directory. The main one is being able to load the shorter programs first, thus saving time when loading into the computer, by not having to waste time going by the longer programs just to get to the shorter ones. It is easier to *CSAVE* programs in groups rather than one at a time, because you have to *SKIPF* past the last program on the tape in order to position the tape for the program you are now going to *CSAVE.*

The program lines up this way:

100-140 — Clears screen, paints border
150-270 — Prints Menu & Instructions
280-380 — Looks for proper selection entered.
390-480 — Acknowledges selection, *CLOADs* program
490-540 — *GOSUB* routine.
550 *GOSUB* for 390 to 480

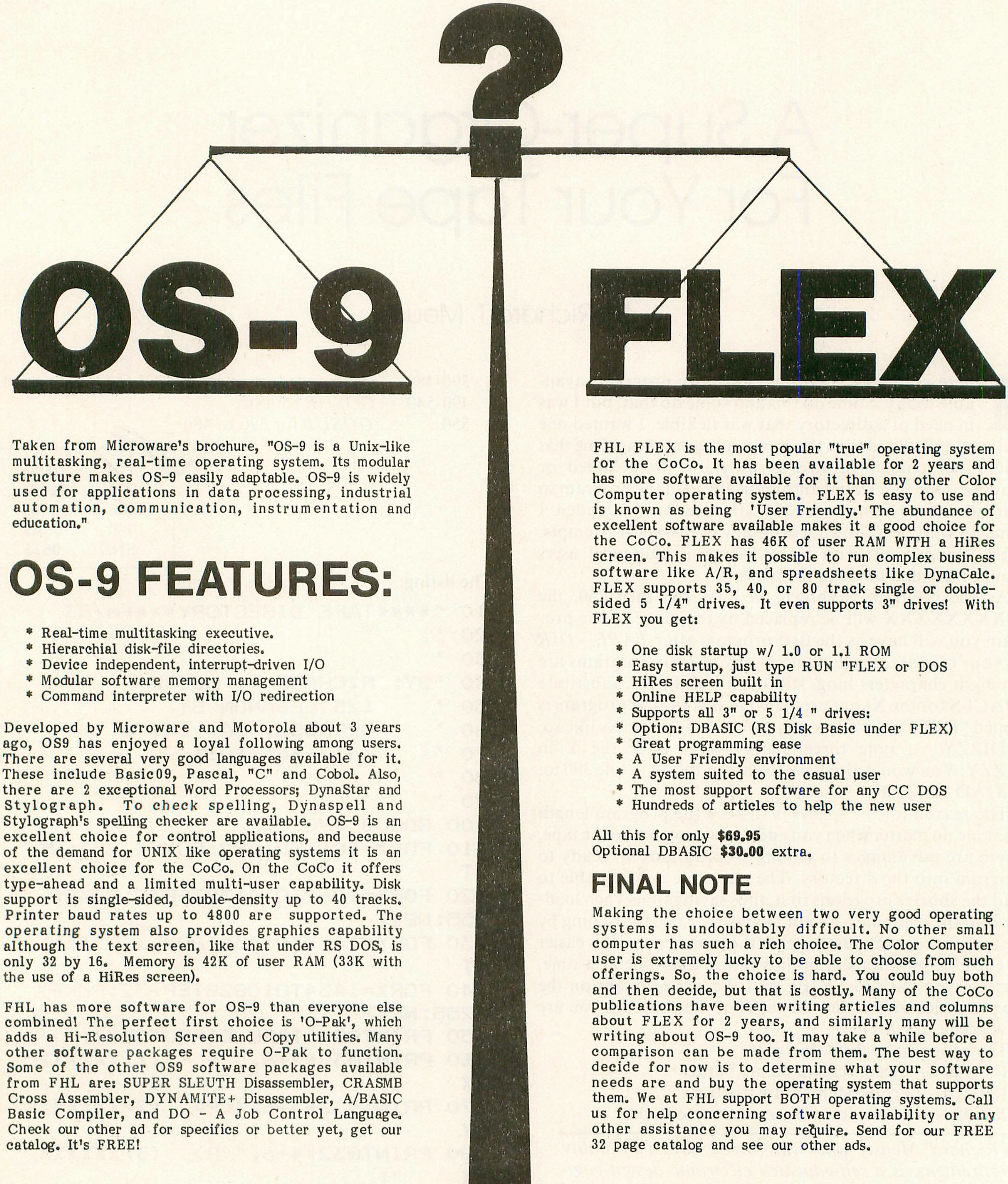
(Richard Meuse, who was forced into a disability retirement, is a self-educated electronic design engineer. His interests include computer electronics and programming, especially in the educational and utility area. When he's not at his keyboard, he spends time on the amateur band as N1CMO, talking about his CoCo, of course.)

150 . . . . 013D
260 . . . . 02DD
380 0403
480 . . . . 05A7
END . . . 067F

The listing:

```
10 '****TAPE DIRECTORY****6/83
20 '
30 '
40 'BY: RICHARD T.  MEUSE
50 '    125 LEBANON ST.
60 '    MELROSE, MA. 02176
70 '    (617)665-6061
80 '
90 '
100 GOSUB 490
110 FORX=1061TO1082:POKEX,255:NE
XT
120 FORX=1061TO1413STEP32:POKEX,
255:NEXT
130 FORX=1413TO1434:POKEX,255:NE
XT
140 FORX=1434TO1082STEP-32:POKEX
,255:NEXT
150 PRINT@9,"TAPE DIRECTORY";
160 PRINT@32*2+6," *   (1)XXXXXX
XX    ";
170 PRINT@32*3+6,"<P>  (2)XXXXXX
XX    ";
180 PRINT@32*4+6,"<R>  (3)XXXXXX
XX    ";
190 PRINT@32*5+6,"<O>  (4)XXXXXX
XX    ";
200 PRINT@32*6+6,"<G>  (5)XXXXXX
XX    ";
```

WHICH "WEIGH" TO GO?



Taken from Microware's brochure, "OS-9 is a Unix-like multitasking, real-time operating system. Its modular structure makes OS-9 easily adaptable. OS-9 is widely used for applications in data processing, industrial automation, communication, instrumentation and education."

OS-9 FEATURES:

- Real-time multitasking executive.
- Hierarchial disk-file directories.
- Device independent, interrupt-driven I/O
- Modular software memory management
- Command interpreter with I/O redirection

Developed by Microware and Motorola about 3 years ago, OS9 has enjoyed a loyal following among users. There are several very good languages available for it. These include Basic09, Pascal, "C" and Cobol. Also, there are 2 exceptional Word Processors; DynaStar and Stylograph. To check spelling, Dynaspell and Stylograph's spelling checker are available. OS-9 is an excellent choice for control applications, and because of the demand for UNIX like operating systems it is an excellent choice for the CoCo. On the CoCo it offers type-ahead and a limited multi-user capability. Disk support is single-sided, double-density up to 40 tracks. Printer baud rates up to 4800 are supported. The operating system also provides graphics capability although the text screen, like that under RS DOS, is only 32 by 16. Memory is 42K of user RAM (33K with the use of a HiRes screen).

FHL has more software for OS-9 than everyone else combined! The perfect first choice is 'O-Pak', which adds a Hi-Resolution Screen and Copy utilities. Many other software packages require O-Pak to function. Some of the other OS9 software packages available from FHL are: SUPER SLEUTH Disassembler, CRASMB Cross Assembler, DYNAMITE+ Disassembler, A/BASIC Basic Compiler, and DO - A Job Control Language. Check our other ad for specifics or better yet, get our catalog. It's FREE!

FHL FLEX is the most popular "true" operating system for the CoCo. It has been available for 2 years and has more software available for it than any other Color Computer operating system. FLEX is easy to use and is known as being 'User Friendly.' The abundance of excellent software available makes it a good choice for the CoCo. FLEX has 46K of user RAM WITH a HiRes screen. This makes it possible to run complex business software like A/R, and spreadsheets like DynaCalc. FLEX supports 35, 40, or 80 track single or double-sided 5 1/4" drives. It even supports 3" drives! With FLEX you get:

- One disk startup w/ 1.0 or 1.1 ROM
- Easy startup, just type RUN "FLEX or DOS
- HiRes screen built in
- Online HELP capability
- Supports all 3" or 5 1/4 " drives:
- Option: DBASIC (RS Disk Basic under FLEX)
- Great programming ease
- A User Friendly environment
- A system suited to the casual user
- The most support software for any CC DOS
- Hundreds of articles to help the new user

All this for only **$69.95**
Optional DBASIC **$30.00** extra.

FINAL NOTE

Making the choice between two very good operating systems is undoubtably difficult. No other small computer has such a rich choice. The Color Computer user is extremely lucky to be able to choose from such offerings. So, the choice is hard. You could buy both and then decide, but that is costly. Many of the CoCo publications have been writing articles and columns about FLEX for 2 years, and similarly many will be writing about OS-9 too. It may take a while before a comparison can be made from them. The best way to decide for now is to determine what your software needs are and buy the operating system that supports them. We at FHL support BOTH operating systems. Call us for help concerning software availability or any other assistance you may require. Send for our FREE 32 page catalog and see our other ads.

FHL Color FLEX

FLEX is the disk operating system you need to run all this software and more on your 64K Color Computer! A single-user system designed to be very powerful yet very easy to learn to use. FLEX features dynamic filespace allocation, random and sequential file accessing, batch job type program entry, user startup facility, automatic drive searching, file dating, space compression, complete user environment control, English error messages, smooth scrolling and much more!

INCLUDES:

- * EASY STARTUP
- * ONLINE "HELP" CAPABILITY
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- * EXTERNAL TERMINAL PROGRAM
- * SIX DIFFERENT HI-RES SCREENS
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- * RECONFIGURABLE TO YOUR NEEDS
- * SUPPORTS ALL 3" AND 5" DRIVES

All this for only **$69.95**!

LANGUAGES

DBASIC

Radio Shack 1.0 Disk Basic adapted to work with FHL Color FLEX: **$30.00**

TSC Extended BASIC

TSC XBASIC for CoCo FLEX: **$100.00**

TSC PASCAL

TSC PASCAL CoCo FLEX **$200.00**

A/BASIC COMPILER for OS9 and FLEX

Produce fast, compact, ROMable object code from easy to write BASIC source code.

CoCo FLEX or OS9 Object only: **$75.00**

DYNASOFT PASCAL for FLEX and OS9

This remarkable Pascal Subset is a p-code implementation that only requires 12K of RAM!

CoCo FLEX or OS9: **$59.95**

NEW! DYNA-C for FLEX and OS9

This new "C" subset runs circles around any others in its price class!

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INTROL-C COMPILER for FLEX and OS9

A complete, efficient, fast C compiler which includes a Macro Relocating Assembler/Linking Loader, Runtime Library, and Library Manager.

CoCo FLEX or OS9 : **$375.00**

SOFTWARE DEVELOPMENT TOOLS

ED/ASM

Full feature line-oriented Editor and conditional macro Assembler.

CoCo FLEX version: **$69.95**

OSM

An Extended 6809 Macro Assembler

Generate OS9 or FLEX binary! **$99.00**

CRASMB Macro Cross Assembler

Use the Macro Cross-Assembler and any of the following CPU Personality Modules (CPM's) to assemble that CPU's Source code into OS9, FLEX, Motorola S1-S9 or INTEL-HEX formatted Object code files. Available CPM's: Motorola 6800-2-8, 6801-3, 6805, 6809, Mostek 6502, RCA 1802, INTEL 8080-5, ZILOG Z-80.

CoCo FLEX or OS9:

CRASMB Object only:	**$200.00**
CPM's Object only:	**$ 35.00 each**
CPM's with Source:	**$ 70.00 each**

* SPECIAL * Purchase CRASMB with all modules (Source included) for **$499.00**

SUPER SLEUTH

Examine and modify or disassemble binary program files into source code format. Object code for 6800, 01, 02, 03, 05, 08, 09, or 6502 may be processed.

Object only:

CoCo OS9:	**$49.95**
CoCo FLEX:	**$50.00**
RS DOS:	**$49.00**

DYNAMITE +

Easy to use disassembler complete with cross-reference generator, and label files maintained in text form only.

Object only.

CoCo FLEX:	**$100.00**
CoCo OS9:	**$150.00**

TSC DEBUG

Set up to 32 breakpoints. A must for anyone serious about Assembly Language programming!

CoCo FLEX version: **$75.00**

FHL FLEX Color Utilities

This combination of Toolkit #2 and Extended utilities for FLEX includes: REPAIR, SCAN, REPLACE, INIT, USERINFO, LOAD, SAVETEXT, READTEXT, DISKDUMP, LNKMAT, SEGMAT, MAP, AND DINFO.

Object only:	**$50.00**
w/Source:	**$75.00**

TSC FLEX UTILITIES

This set of FLEX utilities includes memory dump, prompting delete, extended directory display, binary program mapper and 13 more!

$75.00

TSC FLEX DIAGNOSTICS

Examine and repair your FLEX disks. Recover data from a disk with a damaged directory.

CoCo FLEX version: **$75.00**

APPLICATIONS SOFTWARE

DYNASTAR SCREEN EDITOR
WORD PROCESSOR

This extremely powerful, menu-driven Word Processing system is composed of Dynastar, the Text Generator and Dynaform, the Text Formatter/Mail Merge program.

DYNASTAR: for FLEX or OS9:	**$ 90.00**
DYNAFORM: for FLEX or OS9:	**$ 90.00**
Purchased together:	**$175.00**

DYNASPELL Spelling Checker

Use with Dynastar or Stylograph for a complete word processing system. Now with new LOOKUP command!

CoCo FLEX or OS9 versions: **$59.95**

STYLOGRAPH

A complete word processing system which offers total formatting control.

CoCo FLEX:	**$149.95**
CoCo OS9:	**$149.95**

DYNACALC

The powerful electronic spreadsheet for 6809 computers!

CoCo FLEX: **$200.00**

RMS RECORD MANAGEMENT SYSTEM

Five machine language programs that make up one of the most powerful business programming tools available.

CoCo FLEX and OS9 versions: **$200.00**

UDRI

UDRI SOFTWARE FOR FHL FLEX:

* DATA-BASE MANAGER Part I: **$49.95** Part II:	**$ 49.95**
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* PAYROLL PACKAGE:	**$ 99.95**
* SINGLE-ENTRY LEDGER:	**$ 49.95**
* CHURCH CONTRIBUTIONS:	**$ 49.95**
* ACCOUNTS RECEIVABLE:	**$ 99.95**
* ACCOUNTS PAYABLE:	**$ 99.95**
* GENERAL LEDGER:	**$189.00**
* INVENTORY 2:	**$ 69.00**

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PRO-COLOR-SERIES

PRO-COLOR-FILE *Enhanced* $79.95 D

This high level data base development program offers the ability to track any type of information. From Mailing Lists to Expense Records, to Inventory or Court Trials, PRO-COLOR-FILE has the versatility to handle it.

60 Data fields	8 Report formats
Upto 1020 Bytes per record	Summary Reports
Use 1-4 Disk Drives	Screen Reports
4 Color Data Entry Screens	Page titles, numbering
28 User defined Equations	Sort on any Field
Scan File Alphabetically	Sort 3 Fields at once
Duplicate records	Sort any size file
Duplicate fields	Select sub-sets of file

See Reviews in:

Color Computer News -- June 83
Hot CoCo -- August 83
Rainbow Magazine -- June 83

PRO-COLOR-FORMS **NEW** $39.95 D

Generate customized letters by merging PRO-COLOR-FILE data files with a letter. Print a personalized letter to everyone on your list. PRO-COLOR-FORMS will place data anywhere on a full page, even within the text of a letter.

Embedded control codes	32 to 133 characters
6 User designed forms	7 to 66 lines

Have your data printed on pre-printed forms or design your own. Requires PRO-COLOR-FILE to use.

PRO-COLOR-DIR **NEW** $24.95 D

Compile a master listing of all your directories in one data file. This utility program will read a diskette's directory and place the information in one master file. PRO-COLOR-FILE is then used to generate reports or search and update. PRO-COLOR-DIR will store:

Diskette ID name	Date Created
File name/Extension	Date Updated
File type (Basic, ML, Data)	Number of Grans allocated
Number of Sectors allocated	Number of Sectors used
ML Load and Execute address	ML file length

Store 1000 entries! Requires PRO-COLOR-FILE to use.

See your local dealer or send check or money order to:
Derringer Software, P.O. Box 5300, Florence, SC 29502
Visa, MasterCard customers call (803) 665-5676 after 6 pm.
Add $2.00 for Shipping and Handling No C.O.D.'s

PRO-COLOR-FILE, PRO-COLOR-DIR,
PRO-COLOR-FORMS (C) 1983
Derringer Software
All programs require 32k Color Computer Disk System
(Does not require joysticks!)

```
210 PRINT@32*7+6,"<R>   (6)XXXXXX
XX    ";
220 PRINT@32*8+6,"<A>   (7)XXXXXX
XX    ";
230 PRINT@32*9+6,"<M>   (8)XXXXXX
XX    ";
240 PRINT@32*10+6,"<S>   (9)XXXXX
XXX    ";
250 PRINT@32*11+6," *    (0)XXXXX
XXX    ";
260 PRINT@32*13+3,"<<PRESS PLAY
ON RECORDER>>";
270 PRINT@32*14+1,"<<SELECT DESI
RED PROGRAM #   >>";:SOUND144,2
280 A$=INKEY$:IFA$=""THEN GOTO 2
80
290 IFA$="1" GOTO 390
300 IFA$="2" GOTO 400
310 IFA$="3" GOTO 410
320 IFA$="4" GOTO 420
330 IFA$="5" GOTO 430
340 IFA$="6" GOTO 440
350 IFA$="7" GOTO 450
360 IFA$="8" GOTO 460
370 IFA$="9" GOTO 470
380 IFA$="0" GOTO 480 ELSE 280
390 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #1
400 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #2
410 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #3
420 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #4
430 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #5
440 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #6
450 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #7
460 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #8
470 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #9
480 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #0
490 CLS0:SOUND201,2
500 FORX=1024TO1504STEP32:POKEX,
175:NEXT
510 FORX=1504TO1535:POKEX,175:NE
XT
520 FORX=1503TO1055STEP-32:POKEX
,175:NEXT
530 FORX=1024TO1055:POKEX,175:NE
XT
540 SOUND96,2:RETURN
550 PRINT@32*7+3,"PROGRAM #"A$"
IS NOW LOADING";:PRINT@32*9+10,"
PLEASE WAIT";:SOUND126,2:RETURN
```

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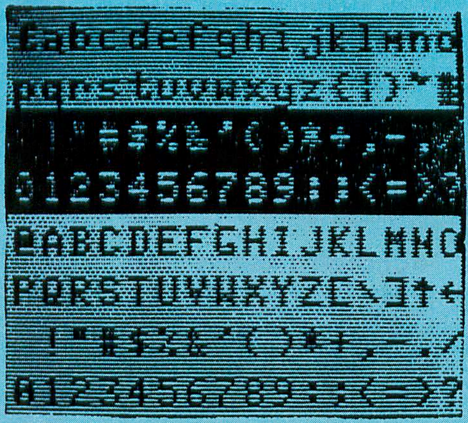
Lower Case For The
COLOR COMPUTER and TDP-100



```
`abcdefghijklmno
pqrstuvwxyz{|}~
 !"#$%&'()*+,-./
0123456789:;<=>?
@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]↑←
 !"#$%&'()*+,-./
0123456789:;<=>?
```

- True lower case characters.
- Fully assembled, tested and guaranteed for 90 days
- No cutting or soldering
- The SPLC-1 is fully compatible with all TRS-80C
- Inverted video at a flip of a switch
- *Installation will void the Radio Shack warranty.*

RAINBOW CERTIFICATION SEAL

$59.95

RAINBOW CERTIFICATION SEAL

L CINT

Lower case interpreter program allows input of lower case command words to be accepted. Also allows for one key pause features and single step through listings. With instructions and cassette, disk compatible. $10.95

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C.O.D. ORDERS ACCEPTED
Sorry, no C.O.D. on printers and monitors.
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12" Green Screen	164.95
12" Yellow Screen	169.95
12" Amber Screen	174.95

VIDEO PLUS

(by Computerware)

This unit will allow you to bring the composite video signal out of the computer to any monitor, color or monochrome. Sound output is also provided. No soldering or holes to cut. Easy installation instructions are provided. $24.95

MEMORY UPGRADE KITS

16K RAM CHIPS . . . . . . 1.50 ea.

*16K/32K

Eight 200 NS Factory Prime Chips with Piggy Backed Sockets, Sam Socket, Bus Wire. Comprehensive Instructions. Recommended for "D" or earlier, but may be used on "E". Only 9 simple solder connections to kit. None to computer. $25.95

*64K RAM CHIPS

Eight 200 NS Factory Prime 64K RAM Chips. Allows you to upgrade "E" board easily. No soldering needed. $69.95

NOTE: 64K upgrade will NOT provide 64K of user Ram, but allows later revision boards (E, ET) to run cooler and more efficiently.

**Installation of these items will void the Radio Shack warranty. Radio Shack is a trademark of the Tandy Corp.*

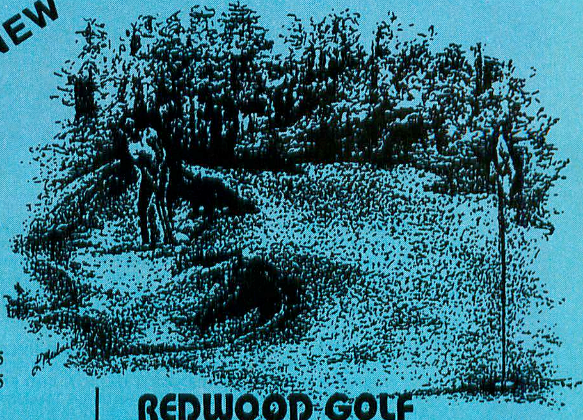
DATABASE / MAILER LETTER WRITER

by EVS

Tape version doesn't require EXT. Basic.
CC-DBM/CC-LW $49.95

All programs warrantied 60 days from date of purchase to original purchaser.

NEW



REDWOOD GOLF

by David C. Lengyel

© JARB software 1983

A truly realistic and interesting golf simulation in hi-res graphics. Each game is different as the fairways are randomly generated. Up to four players can play at a time, and one joystick is required. REDWOOD GOLF is an easy to learn, yet challenging simulation for all ages. On cassette for 32K EXT $24.95

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includes printer & Botek interface

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*** DETAILED USER'S MANUAL WITH SAMPLE TRANSACTIONS ***
*** APPROXIMATELY 800 ACCOUNTS RECEIVABLE/PAYABLE FILES ***
STYLED FOR THE ACCOUNTANT/BOOKKEEPING ORIENTED USER
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Requires 16K and a Single Disk Drive.
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COLORSOFT™ SMALL BUSINESS ACCOUNTING

The COLORSOFT ™ Small Business Accounting package is ideal for the small businessman who wants to take advantage of the time saving benefits of computerized accounting procedures. This package is designed with this person in mind and as such, extensive computer or accounting experience is not required. The feature and options of this package are comparable to much higher priced software.

FEATURES

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COLORSOFT ™ Small Business Accounting is an integrated, ledgerless accounting package for a small business that includes Accounts Payable, Accounts Receivable, Sales, and Purchase Order programs. Outputs of the system include an income statement, balance sheet, check register, accounts payable and receivable status lists, and accounts payable and receivable aging reports. During each user established accounting period (monthly, quarterly, annually, etc.), it will handle sales of up to $1,000,000.00 and approximately 800 accounts payable/receivable. Accounts are automatically numbered and each transaction is carried separately such that an account number will correspond to a specific purchase rather than a specific vendor/customer.

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*** SUPPORTS OVERTIME AND BONUS PAY ***
*** USER FRIENDLY AND FULLY MENU DRIVEN ***
*** HANDLES HOURLY AND SALARIED EMPLOYEES ***
*** MAINTAINS YEAR TO DATE TOTALS PER EMPLOYEE ***
*** HANDLES FEDERAL, STATE, AND LOCAL INCOME TAXES ***
*** DETAILED USER'S MANUAL WITH SAMPLE TRANSACTIONS ***
*** HANDLES OVER 200 EMPLOYEES WITH 8 DEDUCTIONS EACH ***
*** MENU PROMPTS MAKE ENTRIES EASY, FAST, AND EFFICIENT ***

COLORSOFT ™ Payroll is a complete stand-alone package for maintaining personnel and payroll data on the employees of a small business and for calculating payroll and tax amounts and maintaining year-to-date totals for income tax reporting. This system will compute each pay period's totals based on hours worked, calculate taxes to be withheld, allow for specified deductions, compute net pay and prepare a mailing list. Additional reports that are produced include a listing of employees, a year to date federal and/or state tax listing, and a listing of current miscellaneous deductions. This system is suited for use in all states except Oklahoma and Delaware.

Requires 16K and a Single Disk Drive.
PRICE: $99.95

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*** USER DOES NOT NEED TO BE AN ACCOUNTANT ***
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E. COUNSELING - helping others solve personal problems
F. STRESS CONTROL - taking care of yourself

Each program is in a multiple choice questionnaire format where the user is querried as to a response to a specified management situation. Tutorials help the user learn new management skills and insights. The programs include voice annotation from the author, Mr. Terry Barker. "BEING BOSS" is based in part on his forthcoming management books "BOSS TALK" and "THEORY C."

The series, "BEING BOSS",offers to the user the latest in management skill development concepts and should prove to be an invaluable TOOL for anyone who wishes to reach their full potential as a leader. The author has condensed week long intensive workshop material into this outstanding package. The accompanying user's manual is very well written and is easily understood by anyone.

Requires 16K Ext BASIC and cassette.
PRICE $89.95

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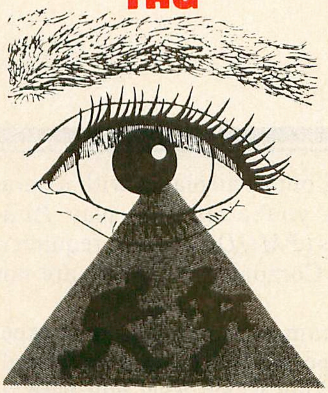
COLORSOFT ^{tm} GAMES

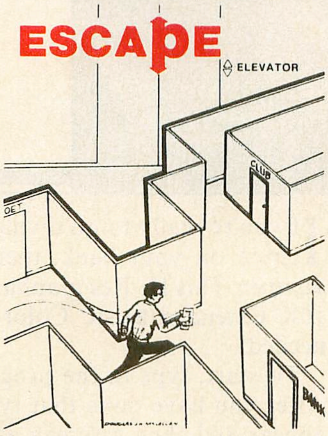
TAG



Classic two player game of chase - fun for all ages.

16K BASIC with joysticks
$12.95

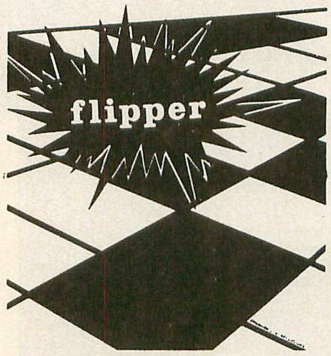
ESCAPE



A 3-D Graphics Adventure designed for the thinker. 8-10 hour game time.

16K BASIC
$18.95

FLIPPER



An excellent version of the Othello type board games. 1 or 2 players.

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Photo by Neal C. Lauron

THE HIGH ADVENTURE OF PARA-JUMPER

BY WARD POLLOCK

If you're ready to go diving out of airplanes with a parachute on your back, then you're ready to play *Para-Jumper*. This Hi-Res graphics (*PMODE 4*) game requires a 16K Extended BASIC Color Computer. Joysticks are not needed.

To start, type in the program and then save it to tape. After you have done that type *RUN*. The title screen will appear and then a screen asking which level you wish to play. There are three different levels of play. They differ in how much the wind affects you, how much time you have to get to the ground, and how much time you have to view the screen before your plane flies across.

After selecting your level, the playing screen will appear in a second. When it does you will see mountains, TV antennae, lightning bolts and atomic waste clouds. All of these must be avoided. You will also see a platform in the middle of the screen at the bottom. The para-jumper must land here. On a cliff overlooking the landing pad you'll see a mining laser. This fires on a timed schedule based on your level of play (the higher the level, the faster it shoots).

Your jump plane will fly across the tōp of the screen from right to left. Whenever you are ready to jump, press the down arrow to eject. To control movement, use the left and right arrow keys. The wind blows left and right and effects your horizontal movement. You may have the left key depreseed yet the wind blows right and the para-jumper doesn't move at all. To increase your downward speed (remember you have to get to the bottom in a certain

(Tommy Pollock is a freshman at Queensbury High School. He has been programming for three years and has taught at computer camps.)

amount of time) press the down arrow. To eject your chute press the up arrow. You do not have to eject immediately. The longer you wait the more points. However, at about two-thirds of the way down you should eject your chute. Note, the keyboard peeks were used to check the keyboard so you may hold keys down for auto repeat.

You are scored for landing safely, landing as quickly as possible, waiting as long as possible for opening your chute and for how far to the right you were when you jumped.

After you land successfully, you will see your score and be prompted to play again. You may respond by pressing Y to play or N or Q to quit.

I hope you enjoy this program as much as I have in playing it and writing it. If you should have any questions or problems concerning this program, or are just interested in how part of it works, write me at : RD#3 Box 288, Glens Falls, NY 12801. If you would like a copy on cassette or 32K disk, send $4 for tape or $6 disk.

```
11......0342
28..... 05F8
47..... 09DE
68..... 0D88
END....1243
```

The Listing:

```
0 CLS0:REM###'para-jumper'/INTER
ACTIVE COMPUTER PRODUCTS/WRITTEN
 BY WARD POLLOCK/ 8-2-82###
1 GOTO72
2 GOTO 61
3 CLS0:PMODE4:PCLS
4 PCLS5:PCLS0
5 OP=0:LINE(0,64)-(8,68),PSET:LI
NE(8,68)-(33,92),PSET:LINE(33,92
)-(48,88),PSET:LINE(48,88)-(76,1
32),PSET:LINE(76,132)-(88,156),P
SET:LINE(88,156)-(92,192),PSET
6 PAINT(8,160),5,5
7 LINE(176,192)-(196,172),PSET:L
INE(196,172)-(216,172),PSET:LINE
(216,172)-(220,168),PSET:LINE(22
0,168)-(220,144),PSET:LINE(220,1
44)-(232,132),PSET:LINE(232,132)
-(255,132),PSET:PAINT(250,172),5
,5
8 CIRCLE(124,24),20,5,.33:PAINT(
124,24),5,5:CIRCLE(212,102),25,5
,.4:PAINT(212,102),5,5:CIRCLE(52
,48),30,5,.25:PAINT(52,48),5,5
9 CIRCLE(128,120),25,5,.4:PAINT(
128,128),5,5
10 COLOR5,0:DRAW"BM112,192C5E4R2
4F4"
11 PJ$(0)="NG3NF3U3R1NF2L2NG2R1U
1":AP$="E4R18E2R2G6L8F5L6H5NR7L7
":PJ$(1)="NG3NF3U3R1NF2L2NG2R1NU
2H6E3R7F2G6":LB$="S5BM182,16G16D
12L20G12F6G20S4":AN$="S6E4NF4U18
NL4NR4U4S4":LL$="G8D6L10G6F3G10"
:LR$="BM240,30"+LL$:LL$="BM98,55
"+LL$
12 DRAW"BM165,192C5XAN$;":DRAW"B
M240,131C5U2R2H4R3F4R4D2":DRAW L
L$:DRAW LR$
13 CX=RND(190)+64:CY=RND(98)+30:
IF PPOINT(CX,CY)<>0 THEN CIRCLE(
160,64),10,5,.25:PAINT(160,64),5
,5ELSE CIRCLE(CX,CY),RND(10)+30,
5,.35:PAINT(CX,CY),5,5
14 COLOR5,0:SCREEN1,1
15 PLAY"XT$;L4ABBBCL8FG":FOR AH=
233 TO 5 STEP PS
16 DRAW"BM"+STR$(AH)+",9C5XAP$;"
:DRAW "C0XLB$;"
17 IF PEEK(342)=247 THEN 20 ELSE
18
18 FORT=1 TO 25:NEXTT:DRAW"BM"+S
TR$(AH)+",9C0XAP$;":DRAW"C5XLB$;
"
19 NEXTAH
20 DRAW"C5XLB$;":PLAY"T55L100ABC
DEFGGFEDCBA":DRAW"BM"+STR$(AH)+"
,9C0XAP$;"
21 PX=AH+5:PY=18
22 DRAW"BM"+STR$(PX)+","+STR$(PY
)+"C5XPJ$(OP);":DRAW LB$
23 FOR TI=1 TO LT
24 DRAW"C0XLB$;XLL$;XLR$;":DRAW"
BM"+STR$(PX)+","+STR$(PY)+"C0XPJ
$(OP);":DRAW"C5XLB$;XLL$;XLR$;"
25 IF PEEK(341)=247 THEN 37
26 IF PEEK(342)=247 THEN 38
27 IF PEEK(343)=247 THEN 35
28 IF PEEK(344)=247 THEN 36
29 PY=PY+DF:WI=RND(WF)-FM:PX=PX+
WI:IF PX<5 THEN PX=5:GW=GW+1ELSE
 GW=GW+1
30 DRAW"BM"+STR$(PX)+","+STR$(PY
)+"C5XPJ$(OP);":IF GW>GT THEN 40
31 IF OP=0 AND PY>110 THEN 42
32 IF PPOINT(PX,PY+3)=5 OR PPOIN
T(PX-3,PY+5)=5 OR PPOINT(PX+3,PY
+5)=5 OR PPOINT(PX,PY-6)=5 OR PP
OINT(PX-3,PY+4)=5 OR PPOINT(PX+3
,PY+4)=5 OR PPOINT(PX+2,PY)=5 OR
 PPOINT(PX-2,PY)=5THEN 42 ELSE 3
4
33 NEXT TI:GOTO 42
34 IF OP=1 THEN IF PPOINT(PX,PY-
8)=5 OR PPOINT(PX+5,PY-6)=5 OR P
POINT(PX-5,PY-6)=5 OR PPOINT(PX-
7,PY-6)=5 OR PPOINT(PX+7,PY-6)=5
 THEN 42 ELSE 33ELSE 33
35 PX=PX-3:IF PX<4 THEN PX=4:GOT
O 29ELSE 29
36 PX=PX+3:IF PX>251 THEN PX=251
:GOTO 29 ELSE 29
37 OS=PY:OP=1:GOTO26
38 PY=PY+(DF-1):GOTO 27
39 GOTO 39
40 IF GG=2 THEN 41 ELSE GG=2:LIN
```

```
E(240,131)-(76,131),PSET:SOUND1,
1:IF PY>127AND PY<138 THEN 42 EL
SE 33
41 GG=0:LINE(240,131)-(76,131),P
RESET:GW=0:GOTO 33
42 IF PY>178 THEN 49
43 DRAW"BM"+STR$(PX)+","+STR$(PY
)+"C0XPJ$(OP);"
44 DRAW"A2;BM"+STR$(PX)+","+STR$
(PY)+"C0XPJ$(OP);"
45 PY=PY+4:IF PY >190 THEN 47
46 DRAW"BM"+STR$(PX)+","+STR$(PY
)+"C5XPJ$(OP);":GOTO 44
47 COLOR5,0:PLAY"T5L12O5GFEO1DCB
A":FORT=1 TO 10:LINE(PX,PY)-(RND
(255),RND(25)+75),PSET:SOUND RND
(10),3:NEXTT:FORT=1 TO 3:SOUND R
ND(50),1:SCREEN1,0:SOUND5,1:SCRE
EN1,1:NEXTT:FORT=1 TO 250:NEXTT
48 GOTO 57
49 IF PX>114 AND PX<140 THEN 50
ELSE 43
50 PLAY"T5L8O3FGO4DEFGO5ABCDEFL2
G"
51 PLAY"L8DDFFGP2AAABCEFGO4DEGO5
L6BAL8CFDEL2G"
52 FORT=1 TO 8:RX=RND(255):RY=RN
D(75):FORR=1 TO 18STEP3:CIRCLE(R
X,RY),R,5:NEXTR,T:SOUND 1,2
53 FORT=1 TO 250:NEXTT:SCREEN1,0
:CLS8:TP=LT-TI:IF AH>122 THEN DP
=AH-122 ELSE DP=122-AH
54 SC=(WF+FM+DF+DP+TP+OS+RND(50)
)*A:PRINT@260,"score";:PRINT@266
,"";:FORT=1 TO SC:PRINT@266,T;:N
EXTT
55 PRINT@361,"TO PLAY AGAIN";:PR
INT@386,"INSERT QUARTER OR PRESS
 'Y'";
56 A$=INKEY$:IF LEFT$(A$,1)="Y"
THEN RUN 2 ELSE IF LEFT$(A$,1)="
N" OR LEFT$(A$,1)="Q" THEN 80 EL
SE GOTO 56
57 CLS5:PRINT@196,"MAYBE YOU SHO
ULD TAKE SOME";
58 PRINT@229,"LESSONS WHEN YOU G
ET OUT";
59 PRINT@264,"OF THE HOSPITAL!!!
";
60 E$="-----SO LONG PAL!!!-----"
:PRINT@356,"";:FORT=1 TO LEN(E$)
:PRINTMID$(E$,T,1);:SOUND RND(5)
,2:NEXTT:FORT=1 TO 700:NEXTT:RUN
2
61 CLS0
62 A$=INKEY$:A$="":PRINT@75,"PAR
A-JUMPER";
63 PRINT@169,"LEVELS OF PLAY";
```

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```
64 PRINT@237,"1";CHR$(128);"EASY
";
65 PRINT@301,"2";CHR$(128);"HARD
";
66 PRINT@365,"3";CHR$(128);"TUFF
";
67 A$=INKEY$:IF A$="" THEN 67 EL
SE A=VAL(A$)
68 IF A<1 OR A>3 THEN GOTO 67 EL
SE ON A GOTO 69,70,71
69 GT=10:DF=3:LT=45:PS=-4:WF=7:F
M=4:T$="T3":PLAY"T55L5505G":GOTO
 3
70 GT=9:DF=3:LT=37:PS=-6:WF=9:FM
=4:T$="T8":PLAY"T55L5505G":GOTO
3
71 GT=7:DF=4:LT=31:PS=-10:WF=11:
FM=6:T$="T14":PLAY"T55L5505G":GO
TO 3
72 PMODE3:PCLS3:PLAY"T3L6AL7BL8C
L9DL10EL11FL13G"
73 PO$="U6R3F1D1G1L3BM+7,3BM+1,0
H1U4E1R2F1D4G1L2BM+6,0NU6R4U1BM+
3,1NU6R4U1BM+3,1BM+1,0H1U4E1R2F1
D4G1L2":DJ$="NG3NF3U3R1NF2L2NG2R
1NU2H7E3R8F3G7":WA$="NU6E2NU1F2U
6BM+3,6U4E2F2D2NL4D2BM+3,0U6R3F1
D1G1L2NL1F3BM+3,0U6R3F1D4G1L3BM+
7,0":DRAW"BM60,190S8C4XWA$;"
74 DRAW"BM+7,0S8C4XPO$;BM+6,0BM+
1,-0H1U4E1R2F1BM+0,+4G1L2BM+6,0U
3NU3R1NE3F3BM+3,0"
75 DRAW"BM128,96C4S29XDJ$;":PW$=
"S8U6R3F1D1G1L3BM+7,3U4E2F2D2NL4
D2BM+3,0U6R3F1D1G1L2NL1F3BM+3,0U
4E2F2D2NL4D2BM+3,0BM+0,-3R4BM+3,
+3S29":PW$(2)="S8BM+0,-1F1R1E1U5
NL1R1BM+3,6BM+0,-1NU5F1R2E1U5BM+
3,6U6F2ND1E2D6BM+3,0U6R3F1D1G1L3
BM+7,3NR4U3NR2U3R4BM+3,+6S29
76 BY$="U6R3F1D1G1NL3F1D1G1L3BM+
7,0BM+0,-3D2F1R2D2L2NH1R2U2U3BM+
3,+3":PW$(3)="S8U6R3F1D1G1L2NL1F
3BM+3,0S29":COLOR4,3:LINE(81,25)
-(176,25),PSET:PAINT(90,20),4,4:
DRAW"BM60,144C4XPW$;XPW$(2);XPW$
(3);":DRAW"S8BM30,170C4XBY$;S29"
:SCREEN1,0
77 FORT=1 TO 8:DRAW"BM128,96C1XD
J$;":SOUND 75,2:DRAW"BM128,96C2X
DJ$;":SOUND200,1:DRAW"BM128,96C4
XDJ$;":SOUND RND(100),1:NEXTT
78 DRAW"S4":SCREEN0,0:PCLS0:GOTO
 2
79 GOTO 79
80 FORT=1 TO 8:CLS8:SOUNDRND(255
),1:NEXTT:POKE65497,0
81 SCREEN1,1:GOTO 81
```

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UTILITY

16K
DISK

The Demystification of ML On Disk

By Kevin Davidson

Machine language programs stored on disk need not be a mystery. A little poking around reveals a simple and logical format. Knowledge of the format gives us a useful programming tool.

Machine language programs are usually the product of an assembler program which converts assembly language programs to the actual machine codes used by the 6809 microprocessor in the Color Computer. These programs eventually end up on disk (for disk systems). The BASIC *SAVEM* command uses the same kind of format on disk (called the binary format). As you may be aware, there are three parameters for the *SAVEM* command: the starting address, the ending address and the execution address. It turns out that only the starting and execution addresses actually appear in the binary file.

In the case of *CSAVEM*, an entire memory range is saved. For assembly language, that may not be the case. Some assembly instructions do not result in machine instructions but rather reserve space (for tables, work space and the like). Such instructions include *ORG* and *RMB*. These "empty" spaces do not appear on the disk. Rather, they divide the program into parts, each with a separate starting and ending address.

The disk file consists, then, of one or more program parts (segments), each preceded by a five-byte header. The first byte of the header is an indicator as to the type of segment. A zero indicates that a program segment follows; a 255 indicates that the next segment contains only the execution address and is the last segment. Bytes 2 and 3 are a 16-bit binary number which is the length of the machine language program segment (starting address-ending address). Bytes 4 and 5 are a 16-bit address where the program is to be loaded. If there is only one program segment (as with *SAVEM*) then the next part is the execution address; otherwise, more program segments with identical formats to the first follow. Finally, the program segments end and the first byte of the header contains the value 255. The next two bytes (2 and 3) are zero. Bytes 4 and 5 are the 16-bit execution address.

(Kevin Davidson is vice president for technical services at a Greenville, SC software company. His interests include medical information systems, systems security and programming languages. He's still waiting for son, Patrick, to grow tall enough to reach the CoCo.)

One practical note: When reading a binary file, *LINEINPUT* cannot be used because it ignores many of the binary values used in a machine program (values less than 32 or greater than 127). I chose to use a direct access file with record length 1 for the task. The following program (values less than 32 or greater than 127). I chose to use a direct access file with record length 1 for the task. The following program, *Readbin*, reads a binary file from disk; it displays the memory address and length of each program segment and, at the end, the ending address and execution address. (Be sure to include the filename extension "/BIN" when supplying the filename to *Readbin*).

Given the ability to read and interpret the binary disk file format, we are equipped to write a much more useful program than one to just read the disk. The next program, *Macdata*, will actually generate BASIC *DATA* statements (in ASCII format) from the disk binary files. The statements are ready to be included in your BASIC program and then can be poked into memory and executed via *EXEC* or *USR*.

NOTE: *Macdata* also generates zeros to fill in any space skipped by the assembler between program segments.

The operation of *Macdata* is direct. You are prompted for an input binary file and an output BASIC file (be sure to include file filename extensions). Since you can supply the start line number and increment for the BASIC statements, it should be possible to use the BASIC *MERGE* command to include the generated BASIC *DATA* statements into your program. The automatic generation of *DATA* statements not only saves typing time, but removes the large possibility of errors which are hard to debug.

Both programs will run on a 16K computer, but can handle machine language programs of any size. With the techniques in this article, you are now equipped to experiment with disk binary files. Go get 'em.

Listing 1:

```
10 'READBIN -- READS BINARY
    DISK FILES AND PRINTS INFO
    BY KEVIN DAVIDSON
    EASLEY, SC
20 INPUT"FILENAME";F$
30 OPEN"D",1,F$,1
40 FIELD1,1 AS C$
50 R=1
60 GET#1,R
```

```
70 IF ASC(C$)=255 THEN 190
80 GET#1,R+1
90 L=256*ASC(C$)
100 GET#1,R+2
110 L=L+ASC(C$)
120 GET#1,R+3
130 A=256*ASC(C$)
140 GET#1,R+4
150 A=A+ASC(C$)
160 PRINT "START: ";HEX$(A),"LEN
GTH: ";HEX$(L)
170 R=R+L+5
180 GOTO 60
190 GET#1,R+3
200 E=256*ASC(C$)
210 GET#1,R+4
220 E=E+ASC(C$)
230 PRINT "LAST ADDRESS: "HEX$(A
+L-1)
240 PRINT "EXECUTION ADDRESS: "H
EX$(E)
250 END
```

```
190 . . . . 01A8
END . . . 03A1
```

Listing 2:

```
10 'MACDATA V1.0
    MACHINE LANGUAGE TO BASIC
    DATA CONVERTER BY
    KEVIN DAVIDSON
20 FILES 2
30 INPUT "BINARY FILE";B$
40 INPUT "BASIC FILE";D$
50 D=2
60 INPUT "BEGINNING LINE #";B
70 INPUT "INCREMENT";I
80 OPEN "D",1,B$,1
90 OPEN "O",D,D$
100 FIELD #1,1 AS C$
110 R=1
120 GOSUB 320 'GET FILE INFO
130 PRINT#D,MID$(STR$(B),2);
140 PRINT#D," 'BEGIN LOAD AT &H"
;
150 PRINT#D,HEX$(X)
160 B=B+I
170 FOR J = 1 TO L
180 GOSUB 490
190 GOSUB 290
200 NEXT
210 LL=L+X+1
220 GOSUB 320
230 IF LL=X THEN 170
240 C=0
250 FOR J=LL TO X
260 GOSUB 290
270 NEXT
280 GOTO 170
290 IF POS(D)=0 THEN PRINT#D,MID
$(STR$(B),2);" DATA ";:B=B+I ELS
E IF POS(D)>200 THEN PRINT#D:GOT
O 290 ELSE PRINT #D,",";
300 PRINT#D,MID$(STR$(C),2);
310 RETURN
320 GOSUB490
330 F=C
340 GOSUB 490
350 L=256*C
360 GOSUB 490
370 L=L+C
380 GOSUB 490
390 X=256*C
400 GOSUB 490
410 X=X+C
420 IF F=255 THEN 430 ELSE RETUR
N
430 PRINT#D
440 PRINT#D,MID$(STR$(B),2);
450 PRINT#D," 'BEGIN EXECUTION A
T &H";
460 PRINT#D,HEX$(X)
470 CLOSE#D,#1
475 PRINT "LAST LINE # USED:";B
480 END
490 GET#1,R
500 R=R+1
510 C=ASC(C$)
520 RETURN
```

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UTILITY

16K ECB

How Fast Is *Your* CoCo?

By Dan Downard
Rainbow Technical Editor

I hope I'm not starting a big argument, but all CoCos do not run at the same speed. We're not going to start a new scoreboard on who's runs the fastest, but the speed of your computer is important for critical timing loops such as I/O and sound generation. This article will introduce you to timing loops and give you a method of measuring the clock frequency of your CoCo.

Don't get alarmed. The clock frequency in the CoCo is crystal controlled and basically all Color Computers run the same speed within a certain tolerance. A trimmer capacitor (C4 on the E-Board) functions to adjust the frequency of the oscillator in the SAM chip. The crystal frequency is 14.31818 MHz. This frequency is divided by four to produce the 3.59 MHz. signal required for the video output. It is again divided by four to produce an .895 Mhz. clock frequency for the 6809E microprocessor. Actually, two clock speeds are made available by using the infamous "high speed poke," POKE65495,0. What the high speed poke does is set the divide logic in the SAM chip to 8 instead of 16, thus giving you a clock frequency of 1.79 MHz.

Microprocessor Timing

How fast is fast? In the "high speed" mode, assuming an average instruction time of 5 machine cycles, dividing the clock frequency by five (1,789,772/5) you get 357,954. Thus, believe it or not, your little CoCo can execute 358,000 machine language instructions in one second. In the "normal" speed mode this figure is reduced to 178,977.

Why do we use timing loops? The best example I can use to illustrate a machine language loop is the printer output routine. If we would disassemble the BASIC ROM at address $A7D3 we would get a printout that looked something like the following:

```
$A7D3 DELAY   LEAX    -01,X      5 cycles
$A7D5         BNE     DELAY      3 cycles
$A7D7         RTS                5 cycles
```

This delay is called by the printer output routine at address $A2BF to provide a half-bit Baud rate delay. The X-register is loaded with the Baud rate constant at $95 before this subroutine is called. Assuming the Baud rate was set to 600, if we examine location $93 we would see $57 or the decimal value 87. We can then calculate the delay:
2*87*8*(1/894886)=.0016 Sec. (.0016=1/6000Baud)

Explanation:

2 =Convert from half-bit to full-bit
87 =Baud rate constant
8 =Number of cycles in delay loop
(1/895886) = length of one machine cycle

Where did we find the number of cycles for each instruction? In any reference manual for the 6809E microprocessor you will find a list of instructions in mnemonic form. One good source is "TRS-80 Color Computer Assembly Language Programming," Radio Shack Cat. No. 62-2077. Look on Page 271. The number of machine cycles for each instruction is given in this data.

Timing loops are also used for cassette and disk I/O. That is the reason you can't use your cassette or disk while in the high speed mode. Why not change the constants so that we can? We will do exactly that in next month's column.

Timer

A listing is included for a short program called *TIMER* that will tell you how fast your computer is actually running. It is a combination of BASIC and machine language showing how to integrate the two using a *USR* instruction.

The actual operation of the program requires the use of a stopwatch or any accurate timing device. The BASIC part of the program provides user prompts and does the math calculations. The machine language routine is set to delay exactly two minutes. After prompting you to start your timer, a tone is generated indicating the beginning of the loop. At the end of the loop another tone prompts you to stop the watch. Enter the actual time elapsed between the tones, and the program will tell you how fast your computer is running.

Just type in the listing exactly as it is shown and type *RUN*. The machine language part of the program is entered into memory by the BASIC program by using *DATA* and *POKE* statements.

Summary

Don't be alarmed if your computer is not running exactly 894,886 Hz. At the same time, if you wish to adjust the clock frequency, adjust the trimmer capacitor associated with the 14.31818 MHz. crystal. It should be adjacent to the crystal on the circuit board. The notation on the E-Board is C4, but this changed on the 285 Board.

All I/O devices can tolerate a certain amount of drift. If this wasn't the case we could not interchange information with remote devices.

We do not recommend adjusting your clock frequency unless you are having I/O problems and know what you are doing. Obviously, the best method is to measure the clock line with a frequency counter, but how many of us have this facility?

(Dan Downard is an electrical engineer and has been involved in electronics for 24 years through ham radio (K4KWT). His interest in computers began about five years ago and he has built several 68XX systems.)

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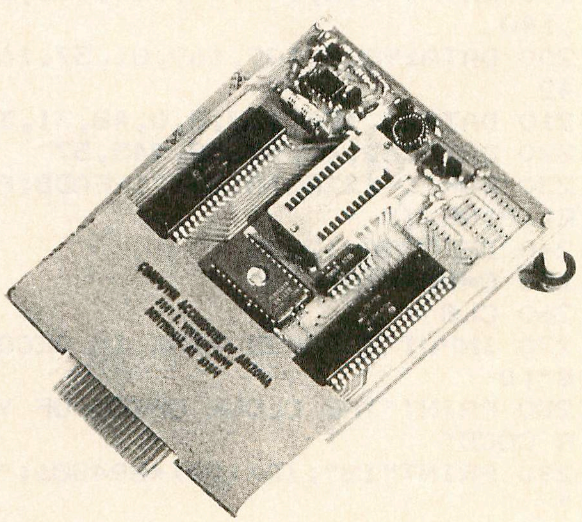

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DEALER INQUIRES INVITED

Next month we will explore doing I/O while using the high speed mode of operation. Not all computers will accept the speedup. See Tony DiStefano's column in January 1983 *Rainbow* for an explanation. For that matter, why use high speed at all when you can execute 179,000 instructions a second without it? Why? Because it's there!

150 ____ 01AB
END ____ 034D

```
10 'CLOCK SPEED TIMER
20 'DAN DOWNARD REV 0
30 'RAINBOW       12/83
40 CLS
50 PRINT"THIS PROGRAM WILL MEASU
RE"
60 PRINT"THE MICROPROCESSOR CLOC
K SPEED"
70 PRINT"OF YOUR COCO.":PRINT
80 PRINT"MEASURE THE INTERVAL BE
TWEEN"
90 PRINT"THE END OF THE FIRST TO
NE"
100 PRINT"AND THE BEGINNING OF T
HE"
110 PRINT"SECOND WITH AN ACCURAT
E"
120 PRINT"CLOCK OR WATCH."
130 PRINT"ENTER THE ELAPSED TIME
 AT"
140 PRINT"THE PROMPT AND YOUR CL
OCK"
150 PRINT"SPEED AND RELATIVE SPE
ED"
160 PRINT"WILL BE DISPLAYED."
170 PRINT
180 INPUT"HIT ANY KEY TO PROCEED
";A$
190 DATA141,2,141,10,134,100,151
,140
200 DATA198,5,189,169,81,57,16,1
42
210 DATA25,150,142,8,0,48,31,38
220 DATA252,49,63,38,245,57
230 FOR X=12288TO12317:READB:POK
EX,B:NEXTX
240 DEFUSR0=12288
250 C=USR0(0)
260 CLS
270 INPUT"ELAPSED TIME IN SECOND
S";D
280 PRINT"THE CLOCK SPEED OF YOU
R COCO"
290 PRINT"IS";(D/120)*894886;"HZ
"
300 PRINT"THIS IS";(D/120)*100;"
% OF THE"
310 PRINT"CRYSTAL FREQUENCY"
320 END
```

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". . . PICTURE getting your instantaneous investment report over the phone, using it in your spreadsheet calculation, generating a report, and writing a memo including that report and data from your database with your word processor, and all this with VIP Library™ programs . . ."

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The Library Programs

For your writing needs is the **VIP Writer™**, and its spelling checker, the **VIP Speller™**. For financial planning and mathematical calculations you can use the **VIP Calc™**. To manage your information and send multiple mailings there is the **VIP Database™**. For sending all these files to and from home or the office and for talking to your friends you can have the **VIP Terminal™**. Finally, to fix disks to keep all your **Library** files in good repair we offer the **VIP Disk-ZAP™**.

Mini Disk Operating System

The Disk versions each have a Mini Disk Operating System which will masterfully handle from 1 to 4 drives. It offers smooth operation for such features as the ability to read a directory, display free space on the disk, kill files, save and automatically verify files, and load, rename and append files. **Library** programs simply do not have the limitations of BASIC.

Professionalism

The **Library** comes handsomely bound in gold-embossed, padded leatherette binders to grace your work area with the professionalism it deserves. Welcome the **VIP Library™** into your home and office.

A description of each of the **Library** programs, with the special sale price, is contained in the following pages. Please indulge!

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VIP Writer™

(Formerly Super "Color" Writer II)
By Tim Nelson

**RATED TOPS IN RAINBOW, HOT COCO,
COLOR COMPUTER MAGAZINE AND BASIC COMPUTING
The Official Dragon Microcomputer Word Processor†**

The most powerful and easy-to-use word processor is available in the showpiece and workhorse of the **Library: The VIP Writer™**. Because of its undisputed superiority over all Color Computer word processors, it was selected by Dragon Data Ltd. of England to be the Official Word Processor for its line of Dragon microcomputers.

The result of two years of research, the **VIP Writer™** offers every feature you could desire from a word processor. It is the most powerful, fastest, most dependable and most versatile. With the display, workspace and compatibility features built into the **Library** the **Writer** is also the most usable.

". . . Nearly every feature and option possible to implement on the Color Computer. The design of the program is excellent; the programming is flawless . . . Features for the professional, yet it is easy enough for newcomers to master . . . Certainly one of the best word processors available for any computer . . ." October 1983 "Rainbow"

The **Writer** will work with you and your printer to do things you always wanted to do. Every feature of your printer can be put to use, every character set, every graphics capability at any baud rate, EVEN PROPORTIONAL SPACING. All this with simplicity and elegance.

Although all versions feature tape save and load, the disk version provides the Mini Disk Operating System common to the whole **Library**, plus disk file linking for continous printing.

Professional features of particular note:

- Memory-Sense with **BANK SWITCHING** to fully utilize 64K, giving not just 24 or 30K, but up to 61K of workspace with the rompak version and 50K with the disk version.
- TRUE FORMAT WINDOW to EXACTLY replicate the printed page ON THE SCREEN BEFORE PRINTING, showing centered line headers, FOOTNOTES, page breaks, page numbers, & margins in line lengths of up to 240 characters. It makes HYPHENATION a snap.
- A TRUE EDITING WINDOW in all 9 display modes for those extra wide reports and graphs (up to 240 columns!).
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16K ROMPAK $59.95 **32K DISK $59.95**

†Sold as the Dragon Writer™ ONLY by Dragon Data Ltd. and its distributors.

**Super Color "Writer" II in Tape
While They Last $49.95**

VIP Speller™

(Formerly Super "Color" Speller)

THE WRITER'S ESSENTIAL COMPANION

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DISK ONLY $49.95
Lowercase displays not available with this program.

VIP Library™

VIP Calc™

(Formerly Super "Color" Calc)

TRUE VISICALC™ POWER!

By Kevin Herrboldt

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- * STATE OF THE ART LOWERCASE DISPLAYS
- * MEMORY SENSE WITH BANK SWITCHING FOR UP TO 61K in 64K!
- * ROMPAK CARTRIDGE FOR TOTAL WORKSPACE
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VIP Calc™ is truly the finest and easily the most powerful electronic worksheet and financial modeling program available for the Color Computer, from 16 to 64K. Now every Color Computer owner has access to a calculating and planning tool better than VisiCalc™, containing all its features and commands and then some, WITH USABLE DISPLAYS. Use Visicalc templates with **VIP Calc™!**

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Both versions feature Tape save and load, but the disk version also has the Mini Disk Operating System of the entire **Library**.

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(Formerly Super "Color" Terminal)

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By Dan Nelson

From your home or office you can join the communication revolution. The **VIP Terminal™** opens the world to you. You can monitor your investments with the Dow Jones Information Service, or broaden your horizons with The Source or Compuserve, bulletin boards, other computers, even the mainframe at work.

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Disk version requires 32K for lowercase displays.

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VIP Database™

(Formerly Super "Color" Database)

INCLUDES MAIL MERGE CAPABILITIES TOO!

By Tim Nelson

This high speed MACHINE LANGUAGE program fills all your information management needs, be they for your business or home. And it does so better than any other database program for the Color Computer, featuring machine code, lowercase screens and mailmerge capabilities. Inventory, accounts, mailing lists, family histories, you name it, the **VIP Database™** will keep track of all your data, and it will sort and merge **VIP Writer™** files.

The **VIP Database™** features the **Library** Memory Sense with BANK SWITCHING and selectable lowercase displays for maximum utility. It will handle as many records as fit on your disk or disks. It is structured in a simple and easy to understand menu system with full prompting for easy operation. Your data is stored in records of your own design, each divided into up to 255 fields. Each field will hold up to 255 characters. All files are fully indexed for speed and efficiency. Full sort of records is provided for easy listing of names, figures, addresses, etc., in ascending or descending alphabetic or numeric order. You may also combine files, sort and print mailing lists, print "boiler plate" documents, automatically insert text in standardized forms, address envelopes - the list is endless. The math package even performs arithmetic operations and updates other fields. Create files compatible with the **VIP Writer™** and **VIP Terminal™**. Up to five different print formats are available, and control codes may be imbedded for use with all printers.

As with all other **Library** programs, the **Database** features the powerful Mini Disk Operating System.

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RAVED ABOUT IN THE APRIL 1983 "RAINBOW!"

By Tim Nelson

Your database file disk, form letter disk, or BASIC program disk goes bad. An I/O error stops loading, or even backing up of the disk. Weeks, even months of work sit on the disk, irretrievable. Now catastrophic disk errors are repairable, quickly and with confidence, using the **VIP Disk-ZAP™**. It is the ultimate repair utility for simple and quick repair of all disk errors. Designed with the non-programmer in mind, the **VIP Disk-ZAP™** will let you retrieve all types of bashed files, BASIC and Machine Code programs.

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32K
ECB

HAPPY GRAPHIC HOLIDAYS

BY DON INMAN

There are times when I want to add text to programs that use graphics. Instead of using a commercial program, I prefer to customize my own text characters. Creating your own provides more freedom of expression and a greater sense of personal satisfaction.

In this month's article, I will explain a simple version of a program in Extended BASIC that you can change and/or expand to fit your own needs.

The program uses *PMODE 4* to provide high resolution and to avoid blurred characters that often occur in the 4-color modes. However, other *PMODE*s can be used. An array of strings that are used in *DRAW* statements to form the text characters are loaded into the program from a subroutine.

Another subroutine is used for the module of your application program. You insert the graphics for which you wish to add text in this subroutine.

A third subroutine is provided to *INPUT* numeric data. An entry must be made for the text character size. Another entry is made to provide the beginning screen line of your text.

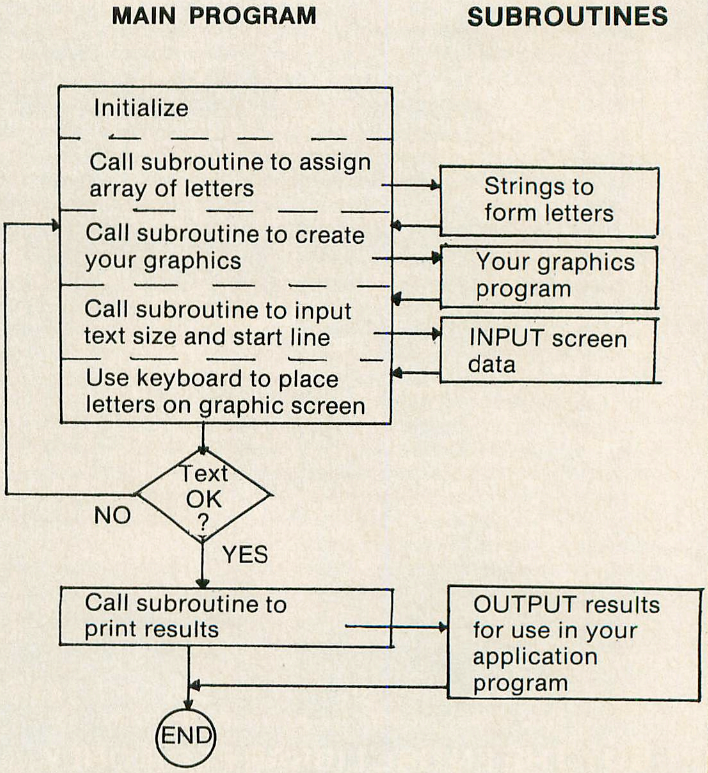
A blinking cursor that appears at the left-most position of the selected line. The space bar is used to move the cursor to the desired point on that line. You then type in the message from the keyboard. Letters that you type are displayed in the size that you selected in the *INPUT* subroutine. The letter array provides for the 26-character alphabet in capital letters, a comma, a period, a space, and the cursor. You can enlarge the array if you wish to provide other symbols.

If you are not satisfied with your text message you may start from the beginning by pressing the up-arrow key. This will clear the screen and display your original graphics with no text. You may then re-enter the inputs that control the size and placement for the text and start over.

When you are satisfied with the text placement, press the down-arrow key. This sends you to another subroutine that will display the results that include:

1) the letter size used,
2) the starting line number of the text, and
3) a list of the array elements used to form your message.

The program flow goes something like this.

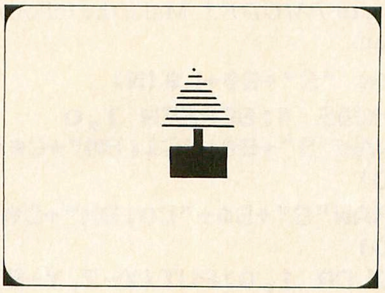

MAIN PROGRAM
SUBROUTINES
Initialize
Call subroutine to assign array of letters
Strings to form letters
Call subroutine to create your graphics
Your graphics program
Call subroutine to input text size and start line
INPUT screen data
Use keyboard to place letters on graphic screen
Text OK ?
NO
YES
Call subroutine to print results
OUTPUT results for use in your application program
END

(Don Inman is the acknowledged master of microcomputer graphics and the author of a large number of books, including "TRS-80 Color Computer Graphics and Assembly Language Graphics for the TRS-80 Color Computer" with Kurt Inman.)

The text creator program is presented in a very simple form. Feel free to change or enlarge it to fit your needs. I'll use a sample application to demonstrate and explain its use.

The graphics module, to which text is to be added, is contained in the following subroutine. Line numbers from 200-6999 may be used. Our module is quite short.

```
199 REM ** YOUR PROGRAM HERE **
200 PMODE 4,1
205 PCLS:SCREEN 1,0
210 G1$="R10U1L10U1":G2$="U4R1D4
R1"
215 DRAW"BM115,70"+G1$+G1$+G1$
220 DRAW"BM+4,0"+G2$
225 DRAW"BM-22,-4"
230 FOR H=40 TO 2 STEP-4
235 DRAW"R"+STR$(H)+"BU3L"+STR$(
H-2)
240 NEXT H
245 FOR N=1 TO 2000:NEXT N
250 RETURN
```

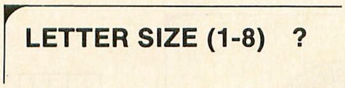


Graphic Produced

While your graphic is being displayed, you should decide the size of the letters to be used and the screen line at which you wish to start. The input subroutine is:

```
6999 REM ** INPUTS **
7000 W$=""
7005 INPUT"LETTER SIZE (1-8)";S$
7010 INPUT"STARTING LINE";L
7015 PMODE 4:SCREEN 1,0
7020 X=2:C$=STR$(X)
7025 M=INT(72/VAL(S$))
7030 K=VAL(S$)*2+2
7035 RETURN
```

The inputs are accepted in this subroutine using the text screen which displays:



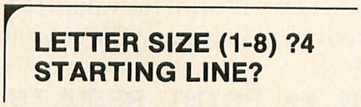
LETTER SIZE (1-8) ?

Although you may use much larger letters, a range of 1-8 is suggested by the prompt. Due to the way in which the letters are formed, the even values of 2, 4, 6, and 8 will look best. The following table shows the number of characters per line and the number of lines that will fit the screen for each letters size.

Letter Size	Characters Per Line	Number Of Lines
2	40	30 (2-31)
4	20	17 (2-18)
6	13	11 (2-12)
8	10	8 (2-9)

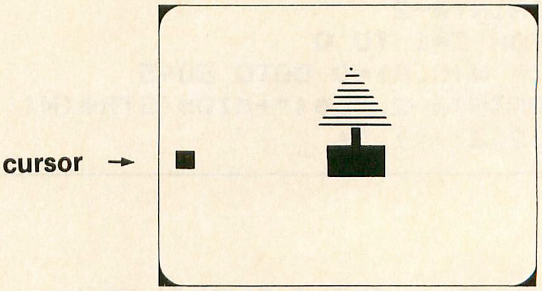
A size of 4 was used for our example.

Next Display



LETTER SIZE (1-8) ?4
STARTING LINE?

After entering the starting line (10 in our example), the program returns to the graphic screen. A cursor blinks at the left side of the selected line.

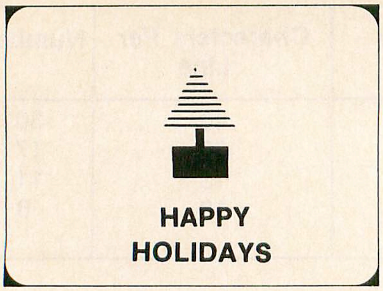


The cursor is controlled by this subroutine.

```
8999 RE ** CURSOR CONTROL **
9000 GET(X-2,Y-8)-(X+16,Y+16),F,
G
9005 A$=INKEY$
9010 IF A$<>"" THEN 9035
9015 DRAW"S"+S$+"C1;BM"+C$+","+Y
$+L$(30)
9020 DRAW"S"+S$+"C0;BM"+C$+","+Y
$+L$(30)
9025 PUT(X-2,Y-8)-(X+16,Y+16),F,
PSET
9030 GOTO 9005
9035 COLOR 1,0:PUT(X-2,Y-8)-(X+1
6,Y+16),F,PSET
9040 RETURN
```

Now it is time to enter text from the keyboard. In our example this was:

(8 spaces) HAPPY (carriage return)
(6 spaces) HOLIDAYS



If you wish to change your message, press the up-arrow key. This will erase the graphic screen, erase the text screen, redraw the graphic, and request new inputs. Try again.

When you are satisfied with the text placement, press the down-arrow key. This will print the values to be used for the text in your application program. The subroutine that provides the output is:

```
7999 REM ** PRINT RESULTS **
8000 PRINT#-2,"FOR YOUR PROGRAM
"
8005 PRINT#-2,"S$ =";S$
8010 PRINT#-2,"L =";L
8015 PRINT#-2,"TEXT LETTERS WERE
 -"
8020 FOR R=L TO M
8025 PRINT#-2
8030 FOR C=1 TO Q
8035 IF W(C,R)=0 GOTO 8045
8040 PRINT#-2,"L$("+MID$(STR$(W(
C,R)),2,2)+"),";
8045 NEXT C
8050 PRINT#-2
8055 NEXT R
8060 RETURN
```

If you wish to display the results on the screen rather than send them to your printer, change all the *PRINT#-2* statements in this subroutine to *PRINT* statements. The output for the example was:

```
FOR YOUR PROGRAM
S$ =4
  = 10
TEXT LETTERS WERE —
L$(27),L$(27),L$(27),L$(27),L$(27),L$(27),L$(27),L$(27),
  L$8,L$(1),L$(16),L$(16),L$(25),
L$(27),L$(27),L$(27),L$(27),L$(27),L$(27),L$(8),L$(15),
L$(12),L$(9),L$(4),
```

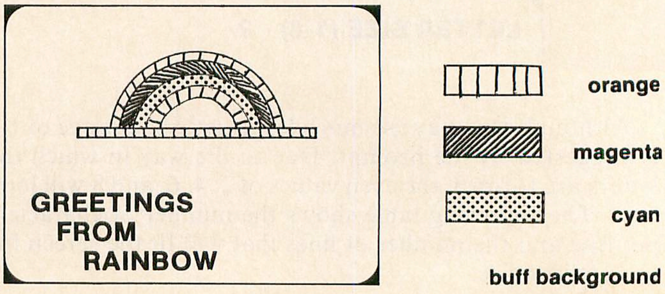
If you want to add more than one graphics/text module to your application program, change the subroutine at Line 200 to create your next module. The text creator program can be used as many times as you need.

A second example provides something a little more colorful by changing to *PMODE3*. Make the following changes to your program.

```
120 DRAW "S"+S$+L$(N)
7015 PMODE 4:SCREEN 1,0
9015 DRAW"S"+S$+"C1;BM"+C$+","+Y
$+L$(30)
9020 DRAW"S"+S$+"C0;BM"+C$+","+Y
$+L$(30)
9035 COLOR 1,0:PUT(X-2,Y-8)-(X+1
6,Y+16),F,PSET

199 REM ** YOUR PROGRAM HERE **
200 PMODE 3,1
205 PCLS:SCREEN 1,1
210 FOR N=85 TO 45 STEP-10
215 CIRCLE(128,90),N,8,1,.5
220 NEXT N
225 DRAW"BM43,90;C8;R175D1L175D1
R175D1L175"
230 PAINT(50,68),8,8
235 PAINT(60,68),7,8
240 PAINT(72,68),6,8
245 PAINT(82,68),8,8
250 FOR N=1 TO 2000:NEXT N
255 RETURN
```

Display



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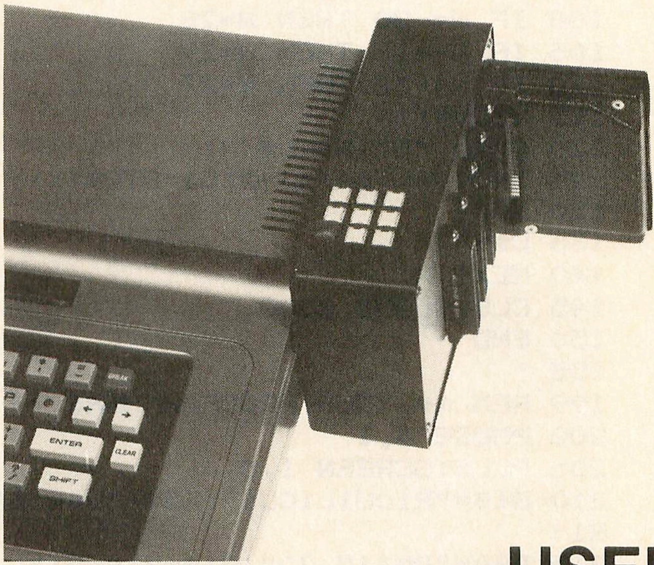

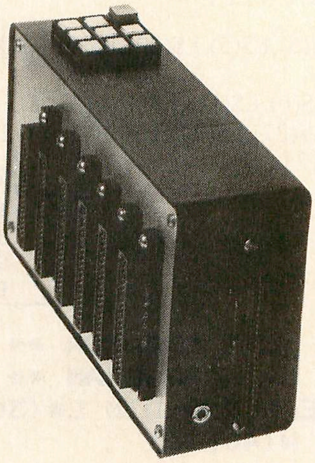

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Output

```
FOR YOUR PROGRAM
S$ = 6
L  = 8
TEXT LETTERS WERE —

L$(7),L$(18),L$(5),L$(5),L$(20),L$(9),L$(14),L$(7),L$(19)
  ,L$(29),
L$(27),L$(27),L$(6),L$(18),L$(15),L$(13),L$(29)
L$(27),L$(27),L$(27),L$(27),L$(18),L$(1),L$(9),L$(14),L$
  (2),L$(15),L$(23),
```

```
155_____ 024B
8015_____0455
9999_____ 05F8
END______0957
```

The listing:

```
10 REM ** TEXT CREATOR **
15 REM ** MAIN PROGRAM **
20 CLS:CLEAR 500:DIM L$(30):DIM
F(40):DIM W(40,30)
25 GOSUB 10000
30 GOSUB 200
35 GOSUB 7000
40 FOR R=L TO M
45 Y=(R-1)*K+K:Y$=STR$(Y)
50 DRAW "S"+S$+"BM"+C$+","+Y$
55 Q=INT(80/VAL(S$))
60 FOR C=1 TO Q
65 GOSUB 9000
70 W$=W$+A$:N=ASC(A$)-64
75 N=ASC(A$)-64
80 IF N=-54 THEN M=R:GOTO 145
85 IF N=30 THEN PCLS:CLS:GOTO 30
90 IF N=-51 THEN W(C,R)=29:C=Q:G
OTO 130
95 IF (N<1 AND N<>-20 AND N<>-18
 AND N<>-32) OR N>26 THEN 65
100 IF N=-20 THEN N=28
105 IF N=-18 THEN N=29
110 IF N=-32 THEN N=27
115 W(C,R)=N
120 DRAW "S"+S$+L$(N)
125 X=C*VAL(S$)*3+2:C$=STR$(X)
130 NEXT C
135 C$="2"
140 NEXT R
145 CLS:GOSUB 8000
150 END
155 '
199 REM ** YOUR PROGRAM HERE **
200 PMODE 4,1
205 PCLS:SCREEN 1,0
210 G1$="R10U1L10U1":G2$="U4R1D4
R1"
215 DRAW"BM115,70"+G1$+G1$+G1$
220 DRAW"BM+4,0"+G2$
225 DRAW"BM-22,-4"
230 FOR H=40 TO 2 STEP-4
235 DRAW"R"+STR$(H)+"BU3L"+STR$(
H-2)
240 NEXT H
245 FOR N=1 TO 2000:NEXT N
250 RETURN
255 '
6999 REM ** INPUTS **
7000 W$=""
7005 INPUT"LETTER SIZE (1-8)";S$
7010 INPUT"STARTING LINE";L
7015 PMODE 4:SCREEN 1,0
7020 X=2:C$=STR$(X)
7025 M=INT(72/VAL(S$))
7030 K=VAL(S$)*2+2
7035 RETURN
7040 '
7999 REM ** PRINT RESULTS **
8000 PRINT#-2,"FOR YOUR PROGRAM
"
8005 PRINT#-2,"S$ =";S$
8010 PRINT#-2,"L =";L
8015 PRINT#-2,"TEXT LETTERS WERE
 —"
8020 FOR R=L TO M
8025 PRINT#-2
8030 FOR C=1 TO Q
8035 IF W(C,R)=0 GOTO 8045
8040 PRINT#-2,"L$("+MID$(STR$(W(
C,R)),2,2)+"),";
8045 NEXT C
8050 PRINT#-2
8055 NEXT R
8060 RETURN
8065 '
8999 RE ** CURSOR CONTROL **
```

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RAINBOW CERTIFICATION SEAL

```
9000 GET(X-2,Y-8)-(X+16,Y+16),F,
G
9005 A$=INKEY$
9010 IF A$<>"" THEN 9035
9015 DRAW"S"+S$+"C1;BM"+C$+","+Y
$+L$(30)
9020 DRAW"S"+S$+"C0;BM"+C$+","+Y
$+L$(30)
9025 PUT(X-2,Y-8)-(X+16,Y+16),F,
PSET
9030 GOTO 9005
9035 COLOR 1,0:PUT(X-2,Y-8)-(X+1
6,Y+16),F,PSET
9040 RETURN
9045 '
9999 REM ** DATA FOR LETTERS **
10000 L$(1)="U8R8D4L8BR8D4BR4"
10005 L$(2)="U8R8D4L8BR8D4L8BR12
"
10010 L$(3)="U8R8BD8L8BR12"
10015 L$(4)="U8R8D8L8BR12"
10020 L$(5)="U8R8BD4L8BD4R8BR4"
10025 L$(6)="U8R8BD4L8BD4BR12"
10030 L$(7)="U8R8BD4L4BR4D4L8BR1
2"
10035 L$(8)="U8BR8D8BU4L8BD4BR12
"
10040 L$(9)="BU8R8BL4D8BL4R8BR4"
10045 L$(10)="U4BU4BR8D8L8BR12"
10050 L$(11)="U8BR8G4L4BR4F4BR4"
10055 L$(12)="U8BD8R8BR4"
10060 L$(13)="U8F4E4D8BR4"
10065 L$(14)="U8F8U8BD8BR4"
10070 L$(15)="U8R6D8L6BR12"
10075 L$(16)="U8R8D4L8BD4BR12"
10080 L$(17)="U8R8D8H4BG4R8BR4"
10085 L$(18)="U8R8D4L8BR4F4BR4"
10090 L$(19)="BU4U4R8BD4L8BR8D4L
8BR12"
10095 L$(20)="BU8R8BL4D8BR8"
10100 L$(21)="U8BR8D8L8BR12"
10105 L$(22)="BU8D4F4E4U4BD8BR4"
10110 L$(23)="U8BR8D8H4G4BR12"
10115 L$(24)="E8BL8F8BR4"
10120 L$(25)="BU8F4E4BG4D4BR8"
10125 L$(26)="BU8R8G8R8BR4"
10130 L$(27)="BR12"
10135 L$(28)="D2G1BE1BU2BR12"
10140 L$(29)="D1BU1R1BR11"
10145 L$(30)="BE1U6BR2D6BR2U6BU1
BL5BD8"
10150 RETURN
```

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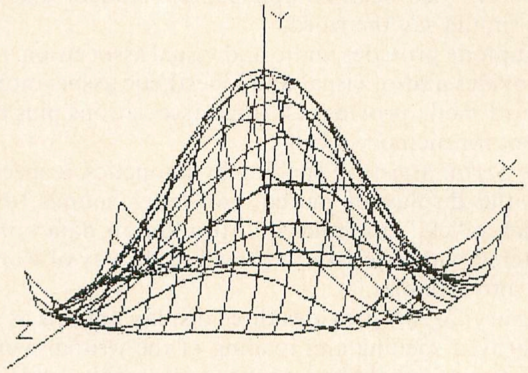

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EDUCATION

16K
ECB

Script Provides Remedial Help In Reading And Spelling

By John Plaxton

Script is a 16K Extended BASIC program that is designed to help slow readers improve their reading and spelling skills. It is meant to be used with both a student and an instructor/parent, but, although not as effective, it can be used by the student alone.

Script uses *PMODE3* to generate lowercase, "written" letters; vowels and consonants are different colors. Written letters may be more conducive than printed letters to teach a student that spelling progresses from left to right. Unlike commercial publications and advertisements, which normally use the printed word, *Script* continually reinforces the hand writing approach, which is most used in school.

Prior to each lesson, at least five words must be placed in a *DATA* statement or statements (for example: 200 DATA A, HOP, MUCH, RUN, QUICK). The total number of words must be 150 or less and each word must contain 11 or fewer letters. These words will be displayed by random selection.

The duration of each lesson is set by the student. In addition to this time limit, the lesson will end if the number of displayable words is less than ten.

Each word can be displayed a maximum of three times. (A data base of five words will provide 15 displayable words.) This limit is included to ensure that one word is not displayed excessively, to the exclusion of other words in the lesson.

For each lesson, the student and instructor will have a choice of one of three display modes. The first mode selects and flashes a word, then spells the word letter-by-letter; as each letter is added to the display, the student should say the sound indicated by the letter. The second mode selects and spells a word, and the student can then type the letters required to spell that word. Again, the student should say each sound as he/she types it. The third mode selects, spells and momentarily displays the word, then the student, without being able to see the word, can type the required letters. Each of these modes can be selected with the option of preventing re-display of any word, on the instructor's prerogative. In any mode, when the word first appears, and also when the word has been completed, the student and/or instructor should say the word.

The first mode provides audio and visual association, the second provides audio, visual and kinesthetic associations, and the third mode provides all three associations plus the requirement for memory recall.

Because *Script* assists in spelling by phonetics, a special feature is the display of paired, two-letter sounds (diagraphs) such as "ck," "th," and "qu." In addition, data words can be entered with asterisks to provide a display of words separated into syllables.

In summary, *Script* provides three display options as an aid to improved spelling and reading of the written word. Special features include the common diagraphs and the capability of breaking a word into syllables. Best results will be achieved with the instructor and/or the student vocalizing the words and the sounds of the letters as each appear.

(John Plaxton, sole owner of Cancoco Software, is an air navigator in the Canadian Armed Forces and is presently working in the aerospace engineering and test establishment. He wrote this initial version in 1982 —after consultation with a resource teacher—for his son who has a minor audio-visual handicap.)

```
936.....0256  1864... 0D82
1112....0411  2024... 105D
1344....0649  2208....1244
1480....0939  2320...13CD
1680...0BAE   END... 15B1
```

The listing:

```
8 CLS7:PRINT@236," SCRIPT ";
16 PRINT@504,"plaxton";
24 '
```

```
32 'data to be input prior to
40 'lesson.  must be at least
48 '11 words, but fewer than
56 '151, all of which must have
64 'ten (10) or fewer letters.
800 DATA STOP1
808 'initialize variables
816 X=RND(-TIMER*TIMER)
824 DIM LT$(32),L(150),D1(12),D1
$(11)
832 'preset max # of displays
840 FOR X=0TO150:L(X)=3:NEXT X
848 GOSUB1344'generate script
856 GOSUB1568'display script
864 GOSUB1760'introduction
872 RESTORE:D=0:N=0:N1=0
880 READ D$:IF D$="STOP1" THEN89
6
888 D=D+1:GOTO880
896 TIMER=0
904 'randomly get word
912 IF TIMER>T1 THEN2152
920 DL=RND(D)-1
928 RESTORE:FOR X=0TO DL
936 READ D$
944 NEXT X
952 'display most of the words
960 'but allow lesson to end
968 DS=0
976 FOR X=0TO D
984 IF L(X)<1THEN NEXT X
992 DS=DS+L(X)
1000 NEXT X
1008 IF DS<10THEN GOSUB2152'end
1016 IF L(DL)=<0THEN920ELSE L(DL
)=L(DL)-1
1024 'flash printed word
1032 CLS(RND(9)-1)
1040 PRINT@235," ";D$;" ";
1048 FOR T=0TO40:NEXT T
1056 FOR S=1TO LEN(D$)
1064 'display word in script
1072 PMODE3,1:PCLS5:SCREEN1,1
1080 DRAW"C6;S8"
1088 DRAW"BM10,100"
1096 FOR S=1TO LEN(D$)
1104 D1$(S)=RIGHT$(LEFT$(D$,S),1
)
1112 IF D1$(S)="*" THEN D1(S)=0:
GOTO1128
1120 D1(S)=ASC(D1$(S))-64
1128 NEXT S
1136 D1(S)=0'space
1144 FOR S=1TO LEN(D$)
1152 DRAW";XLT$(D1(S));"
1160 NEXT S
1168 FOR S=0TO200:NEXT S
1176 PCLS5
1184 IF Z<3 THEN DRAW"BM10,100"
ELSE DRAW"BM10,50"
1192 FOR S=1TO LEN(D$)
1200 GOSUB2352'diagraph?
1208 DRAW";XLT$(D1(S));"
1216 IF D1(S)=0 THEN1240
1224 SOUND175,1
1232 FOR T=0TO500:NEXT T
1240 NEXT S
1248 'reinforce whole word
1256 FOR S=1TO4
1264 SCREEN1,0
1272 FOR T=0TO100:NEXT T
1280 SCREEN1,1
1288 FOR T=0TO100:NEXT T
1296 NEXT S
1304 N=N+1'count # of words
1312 IF Z>2 THEN GOSUB1960'input
 required
1320 IF Z=2OR Z=4OR Z=6THEN GOSU
B2104'prevent redisplay
1328 GOTO904'get another word
1336 'generate script
1344 LT$(0)="BM+11,0"'space
1352 LT$(1)="C7RE3F3R2E2G2L2H3U4
E2R3FRUD9RC6"'a
1360 LT$(2)="RE5U9H2GD14UE5R2FD4
G2L4HFR6"'b
1368 LT$(11)="RE5U9H2GD14UE5R2FD
2GL5R2F3R"'k
1376 LT$(4)="E2F2R3E2BL7U3E2R4FH
2U7EFD13F2"'d
1384 LT$(3)="RE2BE5RUHL3G2D5F2R3
```

Christmas

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VISA

```
EF"'c
1392 LT$(5)="C7R3E4U3H2G2D3F4R2C
6"'e
1400 LT$(6)="R4E4U9H3GD22F2E2U3H
4R5"'f
1408 LT$(9)="C7R4URU8BUUDBDD8RDR
4C6"'i
1416 LT$(15)="C7E2F2R2E2U5H2L2G2
D5U5BRRFR4BD6C6"'o
1424 LT$(21)="C7R2E2U7D7F2RE2U7D
8FRC6"'u
1432 LT$(7)="E3F2R2EBUBL4LU4E2R2
F2D14LDL3UHU2E2R2UER"'g
1440 LT$(8)="R2E3U2RU9H2GD15U5E2
R3F2D4FR"'h
1448 LT$(17)="E3F2R2EBUBL4LU4E2R
2F2D14F2E2U3H4R3"'q
1456 LT$(10)="R3E4URURU2BUUDBDD1
4LDL3UHUE2R2UER2"'j
1464 LT$(12)="R4E4U10H2G2D10F4R3
"'l
1472 LT$(13)="E2U6EFD8U7E2RF2D7U
7E2RF2D6FR"'m
1480 LT$(14)="E2U6EFD8U7E2R3F2D6
FR"'n
1488 LT$(16)="E2D2FD8LU18D3E3RF2
D5G2L3R7"'p
1496 LT$(18)="RE2U7F2DFR3ED5FR"'
r
1504 LT$(19)="RE2UE2UEU2F2RD2RD3
G2L3H2F2R6"'s
1512 LT$(20)="R4URU14RD4L5R8L3D1
0RDR3"'t
1520 LT$(22)="E3U6D6F3E3U5EBD8BF
"'v
1528 LT$(23)="E3U6D6F2DUE2F2DUE2
U5EBD9BR"'w
1536 LT$(24)="EBU4U3ERF3D3G3BRBE
7UHG3D3F3R"'x
1544 LT$(26)="E2U4E3R5F2D2G4F2D6
LDL3UHUE2R2UER3"'z
1552 LT$(25)="C7R2E2U7D6F2RE2U6D
16LDL3UHU2E2R2UER2C6"'y
1560 RETURN
1568 'display/proof script
1576 PCLS5:PMODE3,1:PCLS5:SCREEN
1,1
1584 DRAW"BM10,50;S8;C7"
1592 D=0
1600 FOR T=1TO10
1608 D=D+1
1616 FOR Q=0TO100:NEXT Q
1624 DRAW";XLT$(D);"
1632 NEXT T
1640 DRAW"BM10,100;"
1648 FOR T=1TO10
1656 D=D+1
1664 FOR Q=0TO100:NEXT Q
1672 DRAW";XLT$(D);"
1680 NEXT T
1688 DRAW"BM10,150;"
1696 FOR T=1TO6
1704 D=D+1
1712 FOR Q=0TO100:NEXT Q
1720 DRAW";XLT$(D);"
1728 NEXT T
1736 DRAW SP$
1744 FOR T=0TO1000:NEXT T
1752 RETURN
1760 'instructions
1768 CLS:SCREEN0,0
1776 PRINT@132,"please tell me y
our name"
1784 PRINT@266,"";
1792 INPUT N$
1800 CLS
1808 PRINT@96,"DO YOU WANT  NORM
AL(1)   OR                  DOUB
LE(2)  SPEED"
1816 PRINT"                    "
;:INPUT Z
1824 PRINT:PRINT"  HOW LONG DO Y
OU WANT TO PLAY,           IN MI
NUTES"
1832 PRINT"               ";:INP
UT T1
1840 T1=T1*3600
1848 POKE 65494,0
1856 IF Z=2THEN POKE 65495,1
1864 CLS:PRINT
1872 PRINT"MAKE YOUR SELECTION A
S INDICATED            BELOW."
1880 PRINT"1.  SPELL THE WORD BY
 DISPLAYINGINDIVIDUAL LETTERS IN
 SEQUENCE."
1888 PRINT"2.  SPELL THE WORD AN
D  PREVENT REDISPLAY BY PRESSING
 SPACEBAR."
1896 PRINT"3.  DISPLAY THE WORD,
 THEN TYPE THE LETTERS USING THE
 KEYBOARD."
1904 PRINT"4.  DITTO 3 + PREVENT
 REDISPLAY.";
1912 PRINT"5.  FLASH  THE  WORD,
 THEN TYPE THE LETTERS USING THE
 KEYBOARD."
1920 PRINT"6.  DITTO 5 + PREVENT
 REDISPLAY.";
1928 PRINT:PRINT"SELECT 1, 2, 3,
 4, 5 OR 6 ";:INPUT Z
1936 IF Z=1 OR Z=2 OR Z=3 OR Z=4
 OR Z=5 OR Z=6 THEN1952
1944 GOTO1760
1952 RETURN
1960 'get keyboard input
1968 IF Z=5 OR Z=6 THEN PCLS5're
move word
1976 DRAW"BM10,140"
1984 SOUND220,1
1992 FOR S=1TO LEN(D$)
```

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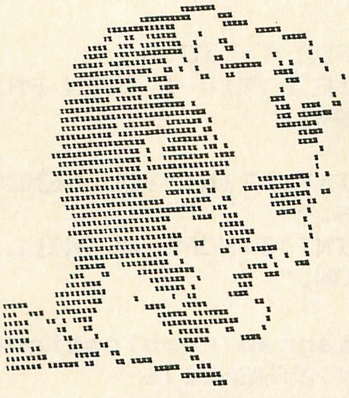
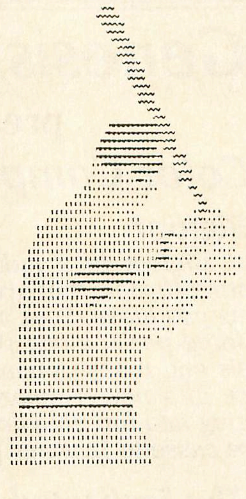
Turn Your Printer Into An Artist!



This unique printer utility introduces the Color Computer to the little known but delightful craft called "Artyping." This is the art of creating pictures using typewritten characters, and Printer Artist puts it at your fingertips. It includes two programs with 12 ready-to-run drawings of of ships, birds and animals, holiday and patriotic themes, famous Americans and more. In addition, there are two utility programs and instructions for 40 additional drawings. Create your own file of printer art and save it to tape or disk. Complete documentation. Fun for home or classroom. Only $21.95 on tape, $24.95 on disk. Requires Ext. Bas.



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```
2000 IF D1(S)=0THEN S=S+1
2008 FOR T=0TO700
2016 IN$=INKEY$:IF IN$=""THEN204
0
2024 IF ASC(IN$)=64+D1(S)THEN SO
UND177,1:GOTO2056
2032 SCREEN1,0:FORQ=0TO50:NEXT Q
:SCREEN1,1
2040 NEXT T
2048 SOUND175,1
2056 DRAW";XLT$(D1(S));"
2064 NEXT S
2072 SCREEN1,0
2080 FOR T=0TO300:NEXT T
2088 SCREEN1,1
2096 RETURN
2104 'prevent redisplay
2112 SOUND220,3
2120 FOR T=0TO500
2128 IF INKEY$<>""THEN L(DL)=-1:
N1=N1+1:RETURN
2136 NEXT T
2144 RETURN
2152 'end lesson
2160 POKE 65494,0
2168 CLS
2176 PRINT@68,"THANK YOU, ";N$
2184 IF N<>0THEN2216
2192 PRINT:PRINT"    BUT YOU HAV
E FORGOTTEN TO              ENT
ER DATA."
2200 PRINT:PRINT"    ENTER DATA
BETWEEN LINES               88 A
ND 788."
2208 PRINT:PRINT"EXAMPLE:      100
DATA SCRIPT,WILL,HELP,YOU,LEARN,
TO,SPELL":END
2216 PRINT:PRINT"    YOU STUDIED
 ";N;" WORDS."
2224 IF Z=1 OR Z=3 OR Z=5 THEN22
72
2232 PRINT:PRINT"    YOU REMOVED
 ";N1;" WORDS."
2240 N2=INT(N1*100/N)
2248 PRINT:PRINT"THAT IS ";N2;"
PERCENT."
2256 PRINT"     ":IF N2>75THEN P
RINT"VERY ";
2264 IF N2>50THEN PRINT"WELL DON
E ";N$;"."
2272 PRINT"      ":PRINT"YOU TOOK
 ";INT(TIMER/360)/10;" MINUTES."
2280 IF Z=1 OR Z=3 OR Z=5 THEN23
36
2288 FOR T=0TO5000:NEXT T
2296 CLS:N=0
2304 RESTORE:FOR T=0TO D
2312 READ M$:IF L(T)=-1 THEN PRI
NT M$;" ";:N=N+1
2320 NEXT T
2328 PRINT:PRINT:PRINT"YOU REMOV
ED ";N;" WORDS."
2336 PRINT:PRINT"I HOPE WE WILL
PLAY AGAIN SOON."
2344 END
2352 'print diagrap combinations
2360 IF D1(S)<>3THEN2376
2368 IF D1(S+1)=8THEN2480'ch
2376 IF D1(S)<>19THEN2392
2384 IF D1(S+1)=8THEN2480'sh
2392 IF D1(S)<>23THEN2408
2400 IF D1(S+1)=8THEN2480'wh
2408 IF D1(S)<>20THEN2424
2416 IF D1(S+1)=8THEN2480'th
2424 IF D1(S)<>3THEN2440
2432 IF D1(S+1)=11THEN2480'ck
2440 IF D1(S)=17THEN2480'qu
2448 IF D1(S)<>19THEN2464
2456 IF D1(S+1)=23THEN2480'sw
2464 '
2472 RETURN
2480 DRAW";XLT$(D1(S));"
2488 S=S+1
2496 FOR T=0TO100:NEXT T
2504 RETURN
```

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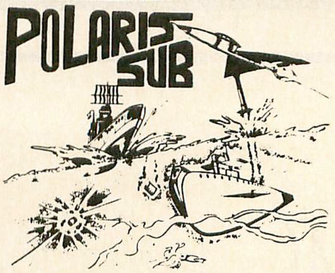

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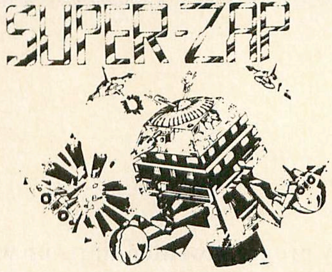

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Menu Maker

By Jorge Mir

Just about every program written starts up with a menu for the user to choose from in order to enter the various subroutines included in the program. As a general rule, menus should contain a few items which can then be followed by various submenus for additional choices. About five or six items should be the limit on each menu and submenu for ease of use.

One of the reasons people shy away from menus is the figuring that must take place in order to properly center the items on the screen and give the menu that professional look found in most of the commercially available programs. The alternative chosen by many is just to list the items on the screen rather than spend the time figuring the various *PRINT@* points.

Well, the program listed below can be used as a subroutine in order to prepare those professional looking menus for you, saving you a lot of figuring time, as well as allowing you to have as many menus as required using only a minimum amount of valuable RAM space.

In order to prepare a menu, all you have to do is create a string with the title and the items you want listed on the menu. For example, if you want a menu entitled "MAIN MENU" and you want to have several choices available such as, "Enter data," "Load data," "Save data," "Print data," and "Exit program" then all you have to do is include the following line in your program:

```
10 D$ = "MAIN MENU,ENTER DATA, LOAD DATA,
SAVE DATA, PRINT DATA,EXIT PROGRAM":
GOSUB 10000: ON I GOTO 100, 200, 300, 400
```

You can then enter the various subroutines to enter, load, save, and print the data or exit the program.

The subroutine can also be used to center a heading for display purposes. For example, if you want to set up a heading called "Loading Program" followed by instructions, etc., then the program step should read as follows:

```
200 D$="LOADING PROGRAM": GOSUB 10000
210 INPUT "ENTER PROGRAM NAME"; PG$
```

You can then continue with the subroutine as required.

I hope this program helps you in developing useful menus with a minimum of effort.

The listing:

```
10000 '**** PRINT MENU ****
10010 LN=0:LL=0:MG=0:MD=1
10020 GOSUB10070:CLS:TB=INT((32-
LEN(DT$))/2)
10030 PRINT TAB(TB)DT$:PRINT TAB
(TB)STRING$(LEN(DT$),CHR$(131))
10040 IF INSTR(D$,",")=0 THEN RE
TURN
10050 GOSUB10070:LN=LN+1:IF LEN(
DT$)>LL THEN LL=LEN(DT$)
10060 DT$(LN)=DT$:IF CM=0 THEN 1
0110 ELSE 10050
10070 CM=INSTR(MID$(D$,MD),",")
10080 IF CM=0 THEN DT$=MID$(D$,M
D):GOTO10100
10090 DT$=MID$(D$,MD,CM-1):MD=MD
+CM
10100 RETURN
10110 MG=INT((26-LL)/2):MG$=STRI
NG$(MG," ")
10120 FOR X=1TO (10-LN)/2:PRINT:
NEXTX
10130 FOR X=1TOLN:PRINTMG$;X"- "
;DT$(X):NEXTX
10140 PRINT @457,"";:INPUT"YOUR
CHOICE";I
10150 IF I<1 OR I>LN THEN SOUND1
00,2:GOTO10140
10160 PRINT@457,STRING$(15," ");
:RETURN
```

(Jorge Mir, a Certified Public Accountant, is currently controller of a Fortune 500 Corporation. Personal computing is his main hobby and he publishes most of his original work through the Rainbow.)

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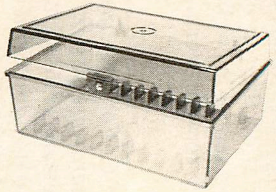

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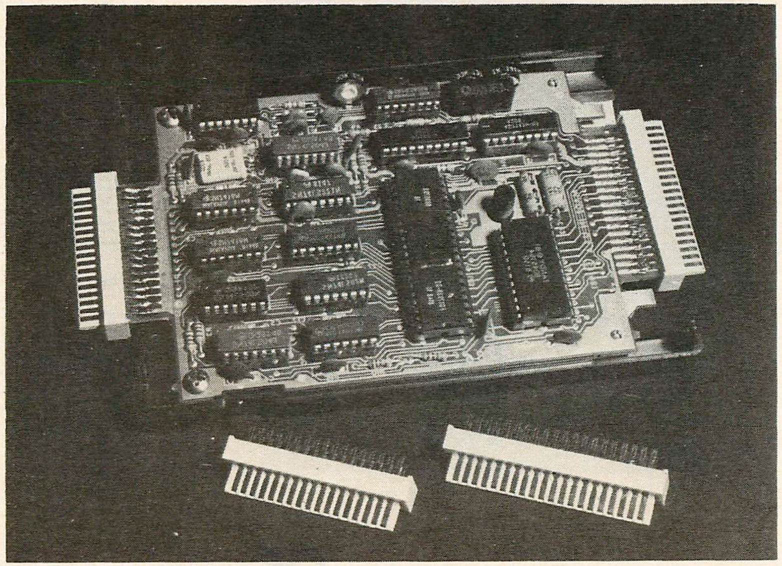

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HARDWARE

BUILD AN RS-232 DEVICE SELECT SWITCH FOR UNDER $20

By David Owen

One of the unfortunate drawbacks of the Radio Shack Color Computer is that it has only a single RS-232 port. There are now available a number of peripheral devices; however owning more than one of these devices requires that they be plugged in and unplugged as appropriate. This is particularly annoying if you use a modem and a printer, and you need to use the printer while you are on-line.

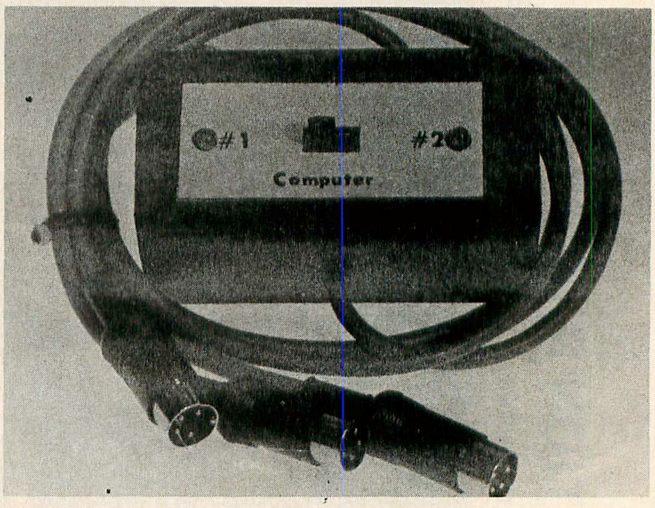
A simple and inexpensive solution is to build your own RS-232 switch. Once you have bought all of the materials (about $17) it will take about an hour to construct it from the instructions I have provided. All of the materials are available at your local Radio Shack store.

The switch uses cables rather than female plugs and two LEDs. An added advantage of the LEDs is that as long as the computer is on, one of the LEDs will remain lit. This helps to avoid leaving your system on overnight (as I have done a number of times). The switch can also be modified easily to add LEDs to the remaining lines which will display all communication activity through the RS-232 port.

The following instructions break down into several sections: first, a listing of the materials required; second, a list of the tools required:third, a step-by-step list of instructions to prepare and construct the switch; fourth, a schematic and wire connection guide and finally, a set of templates to help in drilling the correct locations on the box.

When you have finished building your switch box, cut out the remaining template and glue it on the top of the box. This will cover the switch hole and screws, as well as adding a slightly more professional touch to your work.

(David Owen is the owner of CoFor Systems, which specializes in software and hardware design with an emphasis on menued management systems for mainframes applications. He is also an admissions counselor and systems operator for the ROTC department at Arizona State University.)



The Parts Listing

Radio Shack Pt. #	Description	Quantity	Cost
270-231	Experimenter Box	1	$1.69
276-018	LEDs	2	1.79
270-045	Speaker Switch	1	2.99
271-1311	100 Ohm resistors	2	.39
	4-Pin DIN Cables (male to male)	2	9.96

Tools And Materials Required

Phillips head screw driver (medium-small)
Soldering iron and electronics grade solder
Electric drill
Wire stripper
Razor knife
Needle nose pliers
Electrical tape

The Instructions

1) Trim the leads on the two resistors to about ½ inch in length.

2) Remove the cover plate from the switch and discard it. Keep the two screws. Remove the bottom plate from the box.

3) Trim all twelve of the switch wires to four inches and strip ⅛ inch of insulation off each wire. (NOTE: Eight of the wires are single wires and two are twin-lead wires.)

4) Separate the 12 switch wires into bundles as follows:

Bundle #1 Dual wire, one is blue and one is blue with a white stripe
Dual wire, one is white and one is white with a black stripe
Bundle #2 Four single wires, purple, red, orange, gray
Bundle #3 Four single wires, yellow, white, black, blue

5) Cut out template for the computer side of the box and tape it on either side of the box. Drill a hole where indicated. Hole size is marked on the template.

6) Cut out template for the device side of the box and tape it on the opposite side of the box from the computer side. Drill the two holes where indicated. Hole sizes are marked on the template.

7) Cut out the template for the top of the box and tape it in place. Drill the two holes for the LEDs first, then drill out the center and use the razor knife to square it up. Drill the two screw holes adjacent to the switch hold and countersink them. Hole sizes are marked on the template.

8) Install the switch in the box.

9) Cut one of the plug cables in half, strip two inches of the outer insulation off, then strip ⅛ inch of insulation from each of the four inner wires. (Do this to both halves of the cable.)

10) Cut the remaining cable two inches from one of the ends. Strip two inches off of the insulation on the long piece and strip ⅛ inch of insulation off each of the four inner wires. (NOTE: The short piece of cable and plug are not needed.)

11) Use the long piece of cable and slowly twist it into one of the two device holes previously drilled in the box.

12) Insert the two remaining cables into the two remaining holes in the sides of the box.

13) Solder one 100 Ohm resistor to the positive side of each of the LEDs.

14) Snap the LEDs into the holes drilled in the top of the box.

15) Turn the box upside down so the computer side is closest to you and you are looking into the box.

16) Carefully solder the following wire connections. Refer to the wiring instructions and diagram if necessary.

For The Device Cable On Your Right:

Plug Wire		LED/Resistor	Switch Wire
RED	TO:	RESISTOR AND:	RED
GREEN	TO:		GRAY
YELLOW	TO:		PURPLE
WHITE	TO:	LED LEAD AND:	ORANGE

For The Device Cable On Your Left:

Plug Wire		LED/Resistor	Switch Wire
RED	TO:	RESISTOR AND:	YELLOW
GREEN	TO:		BLUE
YELLOW	TO:		BLACK
WHITE	TO:	LED LEAD AND:	WHITE

For The Computer Side Cable

Plug Wire		Switch Wire
RED	TO:	BLUE
GREEN	TO:	BLUE WITH A WHITE STRIPE
YELLOW	TO:	WHITE WITH A BLACK STRIPE
WHITE	TO:	WHITE

(Note: These switch wires are the twin-lead wires.)

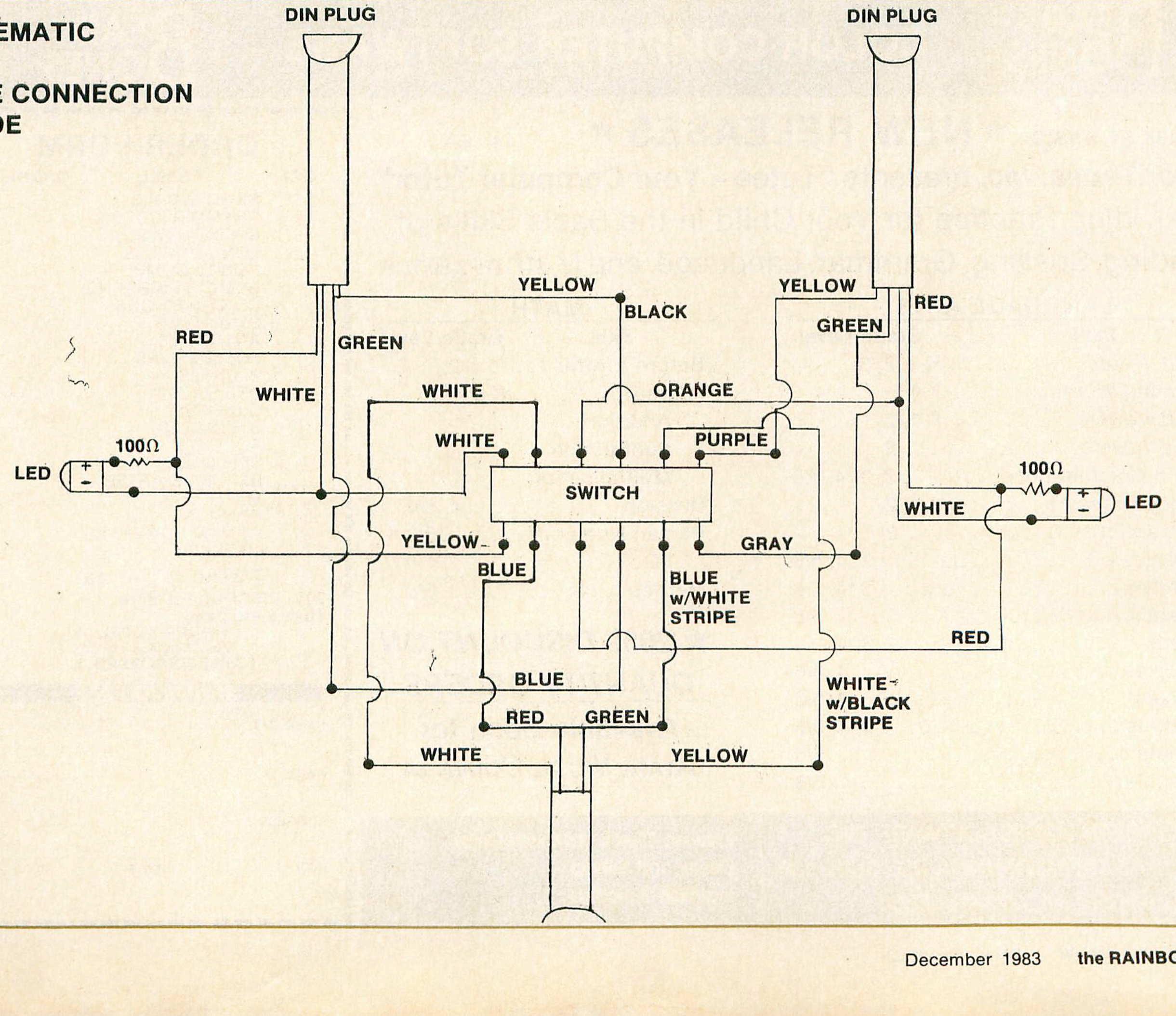
17) Double-check all of your wiring connections, then wrap a small piece of electrical tape around each. Bend the resistors down if necessary to allow the plate to be reinstalled on the bottom of the box.

18) Place small strips of electrical tape on the inside of the cover plate, then replace it on the box.

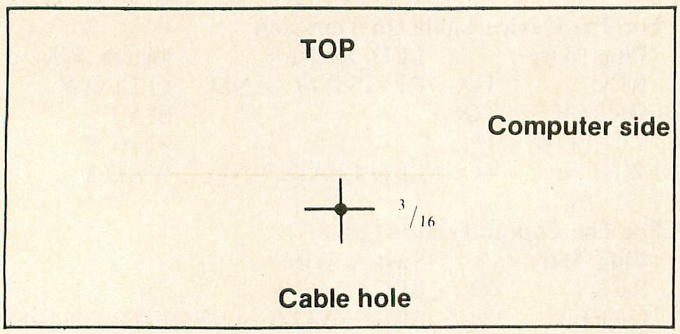
19) Carefully glue the covering template into place. Be sure that it is correctly oriented. The word "Computer" should be over the side with the single cable.

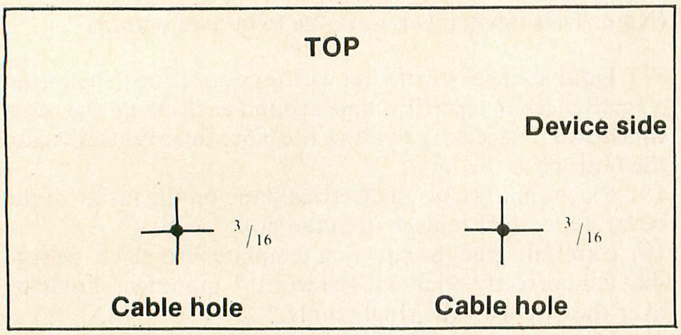
20) Install the switch and when you turn on the computer, the LED corresponding to the switch position should light up. If the switch is reversed, simply open the box and remove the switch, then reinstall it in the opposite direction.

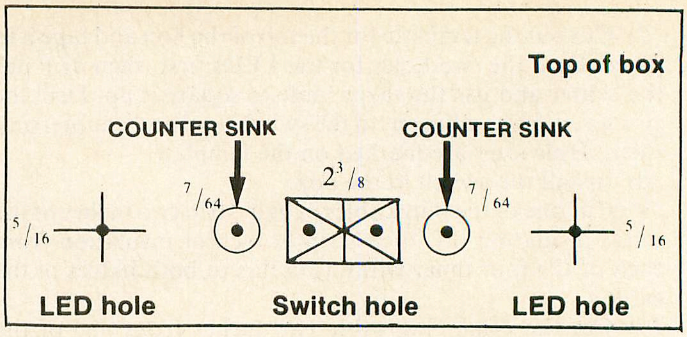
SCHEMATIC AND WIRE CONNECTION GUIDE

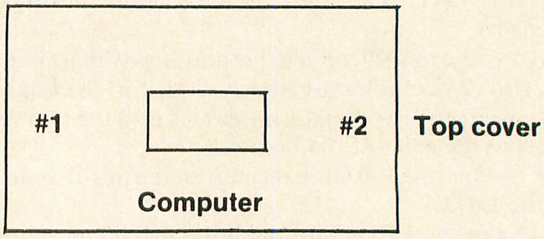


TEMPLATES









I think that you will find this to be a simple, entertaining and educational project. The modifications to add LEDs for the two remaining lines are simple and I will be happy to provide a second schematic if you will send a self-addressed, stamped envelope to David C. Owen, 2340 West University #269, Mesa, Ariz., 85201, or if you would rather purchase one, I will be happy to send you a complete switch box for $25.

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Contractions	2
Synonyms	3, 4, 5/6
Antonyms	3, 4, 5/6
Possessives	5/6
Plurals	3, 4
Pre-Fixes	4, 5/6
Suffixes	4, 5/6
Syllables	3, 4, 5/6
Accents	5/6
Vocabulary	5/6

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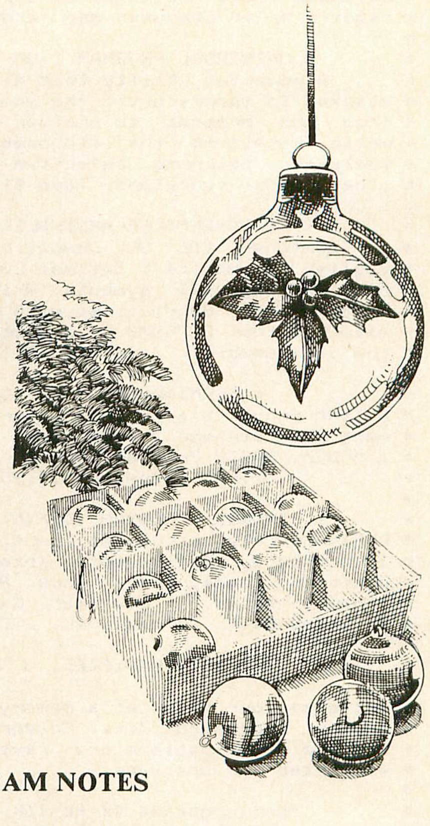

By Robert Mauro

Here's a totally animated and colorfully graphic Christmas card any computer friend would love to get. It paints a multicolored cover, plays "Deck the Halls," plants a Christmas tree, makes it grow, decorates it, and then lets it snow.

Using the *CIRCLE, LINE, PAINT, COLOR,* and *PLAY* functions of Extended BASIC, this program will really brighten the face of any child on Christmas.

So type it into your CoCo and watch the treetop glisten and the children listen as you open your Christmas gift on the morning of the 25th.

Program Breakdown

LINE#	PROGRAM NOTES
10-60	Creates Christmas card cover
70-80	Plays "Deck the Halls"
90-240	Plants tree and makes it grow
250-320	Hangs balls on tree
330-370	Hangs wreaths
380	Lays down grass
400-450	Sets flashing decoration on top of tree and creates tinkling sound
460-470	Lets it snow

```
120.... 017E
270.... 02B4
END....0440
```

The listing:

```
5 REM COPYRIGHT (C) 1983 ROBERT
A. MAURO     LAST UPDATE 5/3/83
10 CLS(8):FOR P=1 TO 510:V=V+1
20 IF V>7 THEN V=1
30 PRINT @(0+P),CHR$(143+16*V);:
NEXTP
40 PRINT@164,"MERRY CHRISTMAS TO
 ALL";
50 PRINT @238,"AND";
60 PRINT @294,"TO ALL A GOOD BYT
E";
70 A$="L4.;C;L8;B-;L4;A;G;F;G;A;
F;L8;G;A;B-;G;L4.;A;L8;G;L4;F;E;
L2;F"
80 PLAY"T5;O3;XA$;T5;O4;XA$;":CL
S
90 PMODE1,1
100 PCLS
110 SCREEN 1,1
120 X1=52:Y1=167:X2=203:Y2=167
130 LINE (X1,Y1)-(X2,Y2),PSET,BF
140 LINE(125,191)-(131,167),PSET
,BF
150 COLOR 7,4
160 LINE(121,191)-(134,183),PSET
,BF
170 COLOR 7,4
180 LINE (114,178)-(141,180),PSE
T,BF
190 LINE(118,178)-(137,182),PSET
210 PAINT(0,191),8,4
220 X1=X1+.5:Y1=Y1-1:X2=X2-.5:Y2
```

(Robert Mauro, who's company, CompuRAM, sells games and educational programs for the CoCo, is a freelance writer. Among other projects, he edits newsletters for the Long Island Center for Independent Living and the Association for Better Conditions for the Disabled—all on the Color Computer.)

CC SOFTWARE

EXTENDED BASIC not Required unless noted. Programs require a 16K Computer and are Disk Compatible.

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* DISASSEMBLER-ASSEMBLER (DISASM) *

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```
=Y2-1
230 IF Y1<15 THEN 250
240 GOTO 130
250 B=83:L=155
260 FOR PP= 1 TO 4
270 FOR YY = 1 TO 3
280 CIRCLE(B,L),10,8
290 CIRCLE(B,L),6,8
300 CIRCLE(B,L),2,8
310 B=B+45:NEXT YY
320 B=83:R=R-1:L=L-35:NEXT PP
330 WW=40:XM=80:FOR PQ = 1 TO 2
340 FOR RADIUS = 16 TO 25
350 CIRCLE (WW,XM),RADIUS,6
360 NEXT RADIUS :WW=215:XM=80
370 NEXT PQ
380 LINE(0,190)-(255,191),PSET,B
F
390 IF Y1=14 THEN 400
400 CIRCLE(126,10),4,RND(8)
410 TT=RND(255)
420 IF TT<220 THEN 410
430 SOUND TT,1
440 PSET(RND(255),RND(191),5)
450 CIRCLE(126,10),6,RND(8)
460 PSET(RND(255),RND(191),5)
470 GOTO 390
,BF
200 COLOR 6,4
```

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INTERFACE A CALCULATOR KEYBOARD TO THE PIA

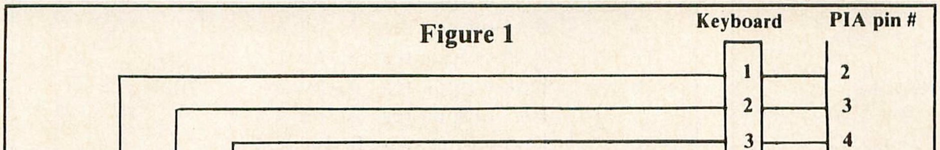
By Dennis Meixsell

In part one of this series we built the experimenter's board and interfaced the Peripheral Interface Adaptor. In this, the second part, we will interface a calculator keyboard to the PIA, write a software driver and explain more about connecting the PIA. Let's jump right into interfacing the keyboard.

The only parts needed will be a calculator keyboard, connecting wire and solder. I used a keyboard from Jameco, part no. KB297043. It cost less than $5 and I was pleasantly surprised at how nice it looked. Here is Jameco's address if anyone needs it: Jameco Electronics, 1355 Shoreway Road, Belmont, Calif., 94002, (415) 592-8097.

The interfacing is very simple. Figure 1 shows the keyboard matrix. Simply connect the keyboard pins to the appropriate pins on the PIA. Note that the switches and the LEDs on the keyboard were not used. At this time I have no use for them, but they present a lot of future possibilities. I used a 2½' cable made of 12 wires to connect the PIA and keyboard. Solder the wires directly to the pins on the edge connector of the keyboard. On the PIA end of the cable, strip ¼" of insulation off and insert these into the solderless breadboard.

Figure 1



Pin #1 on edge card is closest to bottom row of keys

(Dennis Meixsell is actively involved in the EMS system in East Peoria, Illinois, as a firefighter and is currently a student in electronic technology.)

Type in the *Keybod* program and run it. The keyboard should now run like a regular calculator. The only math functions available with my program are add, subtract, divide, multiply. The CE/CA key is used to delete and rerun.

Now to explain a few points about the *Keybod* program. The main objective of the program is to demonstrate the decoding of a keyboard matrix. If you have a copy of the "Color Computer Technical Manual," look at the schematic on Page 68. The CoCo uses a very similar hardware setup for its keyboard. The software used in the CoCo is machine language and is quite different, but this BASIC program illustrates very well the process involved in decoding the keyboard. Let's look at the main question: "How do we decode 32 keys with eight inputs and four outputs?" or in the case of the Color Computer, "How do we decode 52 keys with eight outputs and eight inputs?" I'm glad you asked that question. We must first realize that each of the bits in register A are normally "1." If we *PEEK* side A of the PIA (location

$FF40), we see 255. All pins show a "1." By grounding any of the eight pins 2—9 (bit 0—7), we will get different numbers when we *PEEK* $FF40. By decoding this number we can know which pin was grounded. This was shown by the short test program in part one.

Here is where the four output pins on side "B" come in. Normally, we keep the four output pins equal to "1." To begin reading the PIA, make bit 0 of side B equal to "0" (ground). This is done by *POKEing* $FF42 with 254 or $FE. Now, if any button is pushed in row one, that button will connect one of the bits on side A to ground. This will show at location $FF40. To read the second row, make bit 0 equal to "1" and make bit 1 equal to "0" (ground). This will read row two. Next, make bit 2 equal to ground. Then make bit 3 equal to ground. Repeat this until an input is found. Then the program must jump to a decoding section. This is where the computer decodes which key was pressed, in which row it was pressed and then responds accordingly.

The program is fairly straightforward and you should have no problem following it. Notice that I used Y$ for input. This is to assist in formatting to the screen. I wanted the numbers to move right or left from the decimal point, so I made the input a string to allow me to manipulate its printing format. If functions other than the add, subtract, divide or multiply are desired, then they can very easily be added. The keys may be covered with a new label. When the program sees that key pressed, have it perform the new function on X and val(Y$). If anyone comes up with a great program, be sure to send me a copy on cassette.

Figures 2 and 3 show the pin designation for the side port on the CoCo and the pins on the PIA. This will not answer all of your questions, but it will give you some idea as to

Figure 2

Color Computer's Cartridge Port

PIN#	DESCRIPTION
1	-12 volts (100 MA) * do not exceed maximum current
2	+12 volts (300 MA)
3	HALT input to CPU
4	NMI non maskable interrupt to CPU
5	RESET from CPU
6	E main CPU clock
7	Q clock which leads E
8	CART detects presence of cartridge
9	+5 volts (300 MA)
10	D0 CPU bit 0
11	D1 CPU bit 1
12	D2 CPU bit 2
13	D3 CPU bit 3
14	D4 CPU bit 4
15	D5 CPU bit 5
16	D6 CPU bit 6
17	D7 CPU bit 7
18	R/W CPU read-write signal
19	A0 CPU address bit 0
20	A1 CPU address bit 1
21	A2 CPU address bit 2
22	A3 CPU address bit 3
23	A4 CPU address bit 4
24	A5 CPU address bit 5
25	A6 CPU address bit 6
26	A7 CPU address bit 7
27	A8 CPU address bit 8
28	A9 CPU address bit 9
29	A10 CPU address bit 10
30	A11 CPU address bit 11
31	A12 CPU address bit 12
32	CTS cartridge select signal-decodes addresses $C000-$FFEF
33	GND signal ground
34	GND signal ground
35	SND sound input from cartridge
36	SCS selects addresses $FF40-$FF5F
37	A13 CPU address bit 13
38	A14 CPU address bit 14
39	A15 CPU address bit 15
40	SLENB disables the internal device selection

Figure 3

Pia Pin Designation

1	Vss-ground
2	PA0-output reg. A, bit 0
3	PA1-output reg. A, bit 1
4	PA2-output reg. A, bit 2
5	PA3-output reg. A, bit 3
6	PA4-output reg. A, bit 4
7	PA5-output reg. A, bit 5
8	PA6-output reg. A, bit 6
9	PA7-output reg. A, bit 7
10	PB0-output reg. B, bit 0
11	PB1-output reg. B, bit 1
12	PB2-output reg. B, bit 2
13	PB3-output reg. B, bit 3
14	PB4-output reg. B, bit 4
15	PB5-output reg. B, bit 5
16	PB6-output reg. B, bit 6
17	PB7-output reg. B, bit 7
18	CB1-control interface line
19	CB2-control interface line
20	Vcc-+5 volts
21	R/W-read and write
22	CS0-chip select (decodes PIA addresses)
23	CS2-chip select
24	CS1-chip select
25	E-from main computer clock
26	D7-data bit 7 (computer data buss)
27	D6-data bit 6
28	D5-data bit 5
29	D4-data bit 4
30	D3-data bit 3
31	D2-data bit 2
32	D1-data bit 1
33	D0-data bit 0
34	RESET-reset from CPU
35	RS1-selects side A or B
36	RS0-selects which reg.
37	IRQB-interrupt reg. B
38	IRQA-interrupt reg. A
39	CA2-control interface line
40	CA1-control interface line

what is what. This should give you something to keep you busy.

```
1020....0248
2080... 04A8
2290... 061E
4004... 07AF
END... 095D
```

The listing:

```
1 '*********************
2 '*                   *
3 '* CACULATOR DRIVER *
4 '*                   *
5 '*********************
6 CLS
9 PRINT"* * * C A L C U L A T O
R * * *";
50 'SET VARIABLES
60 A=&HFF40 'LOCATION OF PIA SID
E A
61 B=&HFF42 'LOCATION OF PIA SID
E B
100 'INITILIZE PIA
110 POKE A+1,00 'SELECT DDRA
120 POKE A,00 ' SET ALL BITS FOR
 INPUT
130 POKE A+1,04 'SELECT ORA
140 POKE B+1,00 'SELECT DDRB
150 POKE B,255 'SELECT ALL BITS
AS OUTPUTS
160 POKE B+1,04 'SELECT ORA
1000 ' INPUT READ
1010 POKE B,&HFE 'READ ROW #1
1020 KEY=255-PEEK(A) 'CONVERT IT
 FOR EASIER UNDERSTANDING
1030 IF KEY<>OTHEN ROW=1: GOTO 2
000 'IF INPUT GOT DECODE
1100 POKE B,&HFD 'READ ROW #2
1120 KEY=255-PEEK(A)
1130 IF KEY<>OTHEN ROW=2:GOTO 20
00
1200 POKE B,&HFB 'READ ROW #3
1220 KEY=255-PEEK(A)
1230 IF KEY<>O THEN ROW=3:GOTO20
00
1300 POKE B, &HF7 'READ ROW #4
1320 KEY=255-PEEK(A)
1330 IF KEY<>O THEN ROW=4:GOTO20
00
1400 F=O 'USED TO STOP KEY REPEA
T
1900 GOTO 1000
2000 'DECODE*****************
2001 IF F=ROW+KEY THEN GOTO 1000
 'MAKE SURE LAST KEY IS RELEASED
2002 F=ROW+KEY 'REMEMBER LAST KE
Y
2009 SOUND 1,1
2010 IF ROW=2 GOTO 2100
2011 IF ROW=3 GOTO 2200
2012 IF ROW=4 GOTO 2300
2020 IF KEY=4 THEN O$="-":GOTO 3
000
2030 IF KEY=8THEN O$="-":GOTO 30
00
2050 IF KEY=32 THEN O$="/":GOTO
3000
2080 GOTO1000
2100 'ROW #2*********************
2120 IF KEY=2 THEN Y$=Y$+"000"
2130 IF KEY=4 THEN Y$=Y$+"."
2140 IF KEY=8 THEN Y$=Y$+"8"
2150 IF KEY=16 THEN Y$=Y$+"6"
2160 IF KEY=32 THEN Y$=Y$+"4"
2170 IF KEY=64 THEN Y$=Y$+"2"
2180 IF KEY=128 THEN Y$=Y$+"0"
2190 GOTO 4000
2200 'ROW#3**********************
2230 IF KEY=4 THEN O$="+":GOTO30
00
2240 IF KEY=8 THEN O$="+":GOTO30
00
2250 IF KEY=16 THEN GOTO 5000
2260 IF KEY=32 THEN O$="*":GOTO
3000
2290 GOTO 1000
2300 'ROW#4**********************
```

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```
2310 IF KEY=1 THEN IF Y$=""THEN
RUN ELSE Y$=LEFT$(Y$,LEN(Y$)-1):
GOTO 4000
2330 IF KEY=4THEN Y$=Y$+"00"
2340 IF KEY=8THEN Y$=Y$+"9"
2350 IF KEY=16THENY$=Y$+"7"
2360 IF KEY=32THENY$=Y$+"5"
2370 IF KEY=64THENY$=Y$+"3"
2380 IFKEY=128THENY$=Y$+"1"
2390 GOTO 4000
3000 'OPERATERS  + - * /
3010 IF X<>0 THEN GOTO 6000
3020 IF X=0 THEN X=VAL(Y$):Y$=""
3080 PRINT @161,O$:PRINT @162-LE
N(Y$),Y$
3099 GOTO 1000
4000 'NUMBER INPUT ROUTINE******
*
4004 GOTO 4010
4010 IF X=0 THEN GOSUB 4100:PRIN
T @ 143-LN," ";Y$
4020 IF X<>0 THEN GOSUB 4100:PRI
NT@ 175-LN," ";Y$
4030 GOTO 1000
4100 FOR C= 1 TO LEN(Y$)
4110 IF MID$(Y$,C,1)="." THEN LN
= C: RETURN
4120 NEXT
4130 LN =C:RETURN
5000 'OPERATION  -FINAL CACULATI
ON
5010 IF O$="+" THEN Z=X+VAL(Y$)
5020 IF O$="-" THEN Z=X-VAL(Y$)
5030 IF O$="*"THEN Z=X*VAL(Y$)
5040 IF O$="/"THEN Z=X/VAL(Y$)
5075 PRINT @193,STRING$(30,"-")
5080 PRINT @225,"= ";
5090 PRINT USING "###########,.#
###";Z
5099 X=0:Y$="":Z=0:GOTO1000
6000 'DUPLICATE SIGN*************
*
6010 STOP
```

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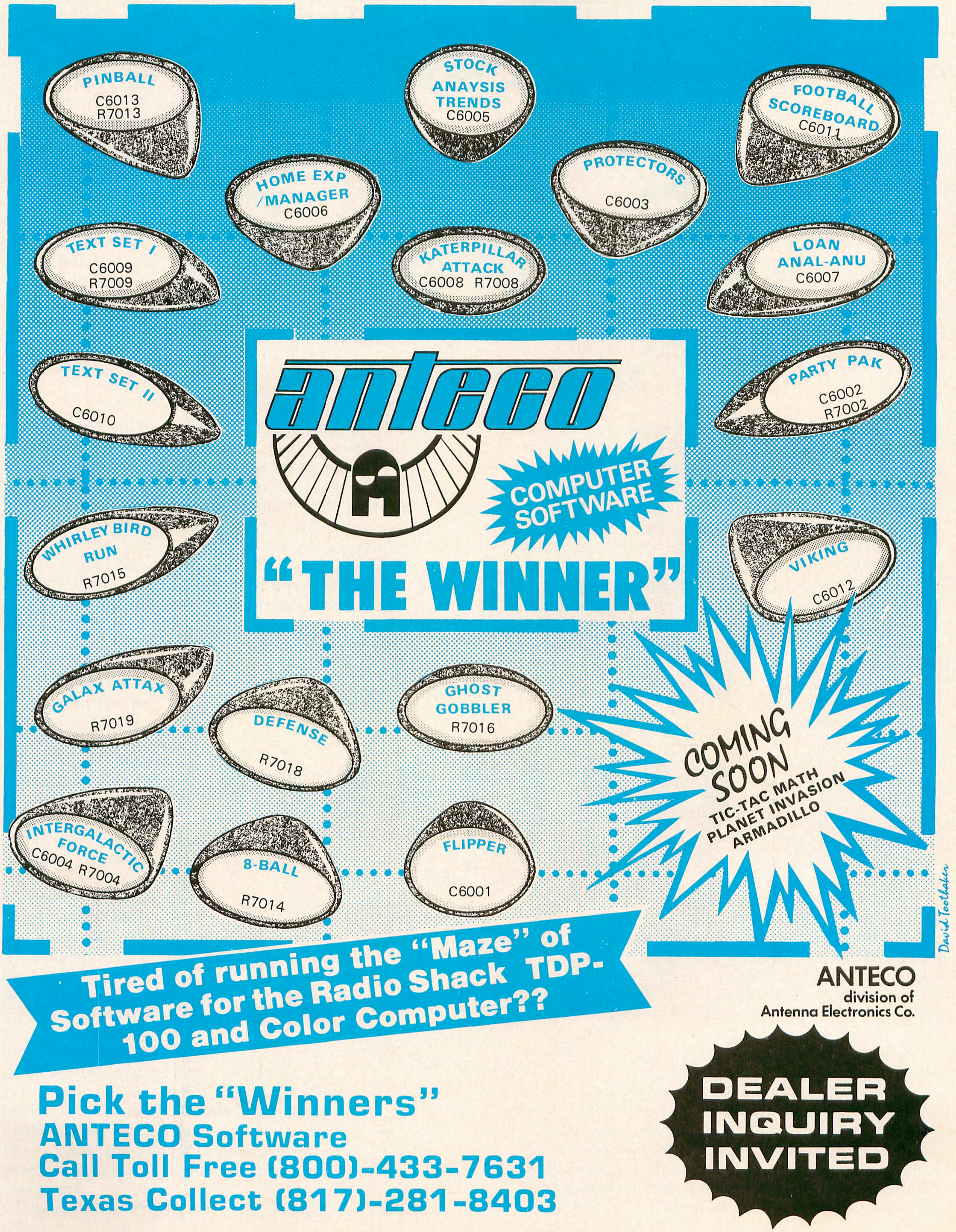
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A HANUKKAH GIFT FOR YOU

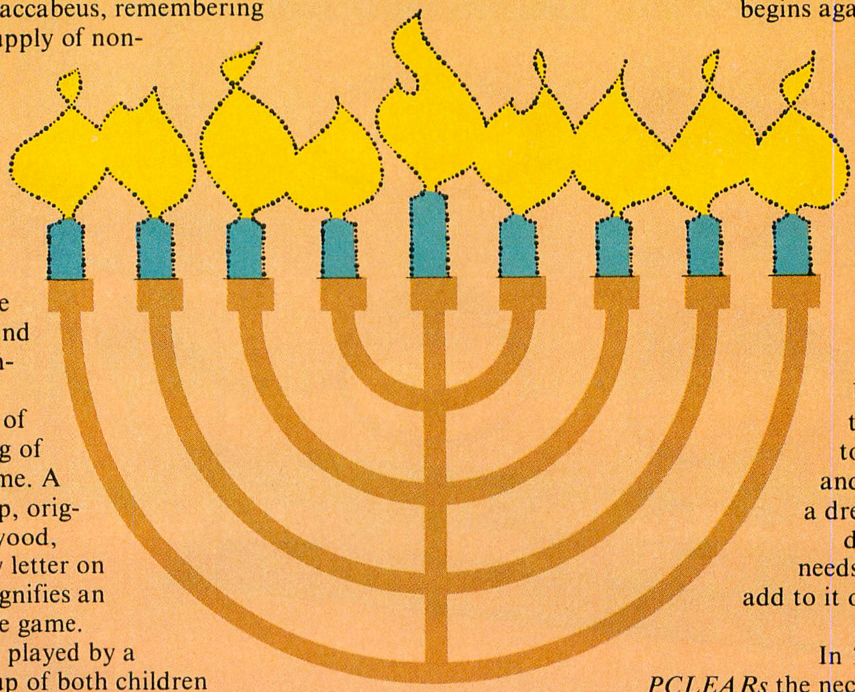
By Stephanie and Bill Snyder

The joyous sounds of excited children receiving brightly wrapped gifts and playing games fills the air. The aroma of Latkes (potato pancakes) and other special holiday foods filters through the house, as the holiday of Hanukkah, the Festival of Lights, is celebrated by Jewish people the world over.

Hanukkah is a Jewish observance which celebrates the rededication of the Second Temple of Jerusalem in 165 BC, after its destruction three years earlier, by a Syrian king. Modern Jews tend to emphasize the military victory of Judas Maccabeus, remembering how a small, one-day supply of non-desecrated oil miraculously burned for eight full days until new oil could be obtained. The ceremony is distinguished by the lighting of a multi-branched candelabrum. One candle is lighted the first day, two the next and so on, until all eight candles are burning.

One of the traditions of Hanukkah is the playing of the dreidl (dray-del) game. A dreidl is a four-sided top, originally made of clay or wood, with a different Hebrew letter on each side. Each letter signifies an action to be taken in the game.

The game of dreidl is played by a group of people made up of both children and adults. There is no limit to the size of the group and, of course, the more, the merrier. Each person has a "stake" made up of coins, buttons, nuts, raisins, or anything else you can think of. At the beginning of a game, each player puts two things into the pishka, or pot. After a lot of arguing over who goes first (usually the youngest, who is crying the loudest!), the player whose turn it is spins the dreidl. Depending on the letter that the dreidl lands on, one of four possible actions are taken. If the dreidl lands on the gimmel, ג , that player takes everything that is in the pishka. If it lands on nun, נ , the player does nothing that round. He neither adds to nor takes anything from the pot. If it lands on hay , ה , the player takes half of what is in the pishka and if the dreidl lands on shin, ש , the player adds two. It is then the next player's turn. In the event that one player spins a gimmel and wins everything, the game begins again with the next person's turn and everyone has to put two things into the pishka. The game ends when everyone decides that they don't want to play anymore. The winner is the person with the most money or buttons, etc.



Traditions, even long-standing ones, can be changed or new ones can be created. It is now time to add another dimension to the Hanukkah tradition and make the computer into a dreidl. In this version of the dreidl game, everyone still needs their own stake and will add to it or take from it depending on the dreidl's spin.

In *The Dreidl Game* Line 10 *PCLEARs* the necessary graphic screens. If you make any modifications, this line must still be the first line of the program.

Line 100 insures that the dreidl's spin is truly random. If you are a constant winner, nobody can accuse you of "fixing" the game. You can simply claim Divine assistance!

Lines 110 through 430 with a *GOSUB* to 560 draw the graphics screens. Those lines include explanations of the Hebrew letters and the actions to be taken. If you do not want to see the Hebrew letters or explanations before the game begins, you can delete the following lines: 90; 160 through 180; 240 through 260; 320 through 340; and 400 through 420. On Line 560, you should then delete SCREEN1,0:.

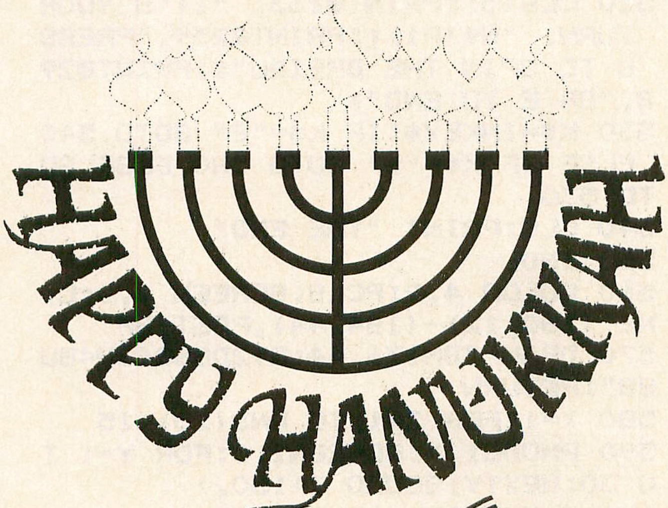
Lines 460 through 490 allow you to set the number of players and *INPUT* their names. Try to keep the names within seven characters. The "name array," N$, is dimensioned by the number of players, P, so that any number of people can play.

Lines 580 through 660 are a subroutine that spins the dreidl and Lines 670 and 680 are a subroutine that is used when a person spins a gimmel and has won everything in the pishka.

To advance the game, you can hit any key, except the [BREAK].

There are many ways to draw high-resolution graphics on the CoCo. In this program, *DRAW* statements were used throughout to create the dreidl, the Hebrew letters and the instructions because they were found to be the most efficient.

During the writing of *The Dreidle Game,* our memories brought us back to our childhood and reminded us of a very successful advertising campaign waged in the New York area. It was an ad depicting a young Oriental child enjoying a sandwich made with "Levy's Real Jewish Rye" bread. The accompanying message read, "You don't have to be Jewish to enjoy Levy's." We feel the same way about *The Dreidl Game.* We hope it will add fun to *your* holiday season!



```
170.....0274
310.....04C4
450.....0758
END ....0A42
```

The listing:

```
10 PCLEAR8
20 REM ****************************
30 REM *    THE DREIDL GAME       *
40 REM *          BY              *
50 REM *   STEPHANIE SNYDER       *
60 REM *        9/15/83           *
70 REM ****************************
80 CLS(8): PRINT@200, "THE DREID
L GAME";: PRINT@458,"HIT ANY KEY
";
90 IF INKEY$="" THEN 90
100 M=RND(-TIMER)
110 FOR D=1 TO 4:ON D GOTO 120,2
00,280,360
120 PMODE 1,1
130 GOSUB 560
140 DRAW "BM144,60;R16D68R28U68L
16BR28R16D68L28"
150 DRAW "BM16,112;U12R8D4L8BR12
BU4D12R8U12BR4R8BL4D12BR16BU12R8
D4L8D8R8BR12BU12D12BR4U12F12U12
160 IF INKEY$="" THEN 160
170 CLS(3):PRINT@136, "THIS IS A
 SHIN...";:PRINT@198,"EVERYTIME
IT APPEARS";:PRINT@228,"YOU PUT
2 INTO THE PISHKA";:PRINT@458,"H
IT ANY KEY";
180 IF INKEY$="" THEN 180
190 GOTO 430
200 PMODE 1,3
210 GOSUB 560
220 DRAW "BM144,60;R68D68BL52U60
"
230 DRAW "BM12,100;R8BL4D12BR8U1
2R8D12BU8L8BR12BU4D12BU6E6BG6F6B
R4U12R8BD4L8BD8R8BR12U12BD4R8BU4
```

(Stephanie Snyder is a former early childhood teacher and a published programmer. She currently is pursuing a second degree in computer sciences. Bill, in his free time, writes articles for several publications.)

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```
D12BR4U12R8D12BL8BU8R8BR4BU4D12R
8BR4U12R8BD4L8"
240 IF INKEY$="" THEN 240
250 CLS(4):PRINT@136, "THIS IS A
 HAY...";:PRINT@198,"EVERYTIME I
T APPEARS";:PRINT@230," YOU TAK
E HALF OF  ";:PRINT@262,"WHAT'S
IN THE PISHKA";:PRINT@458,"HIT A
NY KEY";
260 IF INKEY$="" THEN 260
270 GOTO 430
280 PMODE 1,5
290 GOSUB 560
300 DRAW "BM180,60;R24D68BU20L40
D20"
310 DRAW "BM12,100;R8BL4D12BR8U1
2R8D12BU8L8BR12BU4D12BU6E6BG6F6B
R4U12R8BD4L8BD8R8BR12U12R8D12BU8
L8BR12BU4D12R8BR4BU12D12R8"
320 IF INKEY$="" THEN 320
330 CLS(1):PRINT@134,"THIS IS A
GIMMEL....";:PRINT@198,"EVERYTIM
E IT APPEARS";:PRINT@230,"YOU TA
KE EVERYTHING ";:PRINT@262,"    F
ROM THE PISHKA   ";:PRINT@458,"HI
T ANY KEY";
340 IF INKEY$="" THEN 340
350 GOTO 430
360 PMODE 1,7
370 GOSUB 560
380 DRAW "BM160,60;R48D64L36"
390 DRAW "BM12,100;D12R4E4U4H4L4
BR12D12R8U12L8BR20BD12U12F12U12B
R4R8D12L8U12BR12R8BL4D12BR8U12BR
8D12BU8L8BR12BU4D12BR4U12F12U12B
R4D12R8U4L4BU8BR4L8"
400 IF INKEY$="" THEN 400
410 CLS(7):PRINT@136,"THIS IS A
NUN...";:PRINT@198,"EVERYTIME IT
 APPEARS";:PRINT@233,"YOU DO NOT
HING!";:PRINT@458,"HIT ANY KEY";
420 IF INKEY$="" THEN 420
430 NEXTD
440 CLS(8):PRINT@135,"T O   B E
G I N";:PRINT@192,"EVERYBODY PU
T 2 INTO THE PISHKA":PRINT@458,"
HIT ANY KEY";
450 IF INKEY$="" THEN 450
460 CLS(5):PRINT@197,"HOW MANY P
LAYERS ";:INPUT P
470 IF P=0 GOTO 460
480 DIM N$(P)
490 CLS:FOR X= 1 TO P:PRINT "WHO
 IS PLAYER #";X;:INPUT N$(X):PRI
NT"":NEXT X
500 P1=1
510 IF P1>P THEN P1=1
520 CLS(5):PRINT@133, "IT'S YOUR
 TURN, "N$(P1);:PRINT@259,"PRESS
 S TO SPIN THE DREIDL";:PRINT@29
8,"OR E TO END";
530 K$=INKEY$:IF K$="E" GOTO 540
 ELSE IF K$="S" GOTO 580 ELSE GO
TO 530
540 CLS:PRINT "THE END"
550 END
560 COLOR 4,2:PCLS:SCREEN 1,0:LI
NE (180,12)-(184,44),PSET,BF
570 DRAW "BM136,44;R92D88G48H48U
88":RETURN
580 X=1:FOR Z=1 TO RND(25)+15
590 PMODE1,X:SCREEN1,0:FOR Y=1 T
O 30:NEXTY:SOUND Z+150,1
600 X=X+2:IF X>7 THEN X=1
610 NEXT Z
620 P1=P1+1
630 IF X=7 THEN 650
640 IF INKEY$="" THEN 640 ELSE 5
10
650 IF INKEY$="" THEN 650
660 FOR S=100 TO 250 STEP 20:SOU
ND S,1:NEXT S
670 CLS(8):PRINT@194, "YOU WON E
VERYTHING, ";N$(P1-1)"!!!";:PRIN
T@288,"EVERYBODY PUT 2 INTO THE
PISHKA":PRINT@458,"HIT ANY KEY";
680 IF INKEY$="" THEN 680 ELSE 5
10
```

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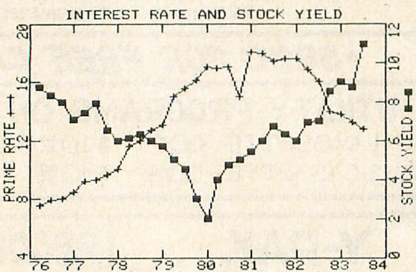

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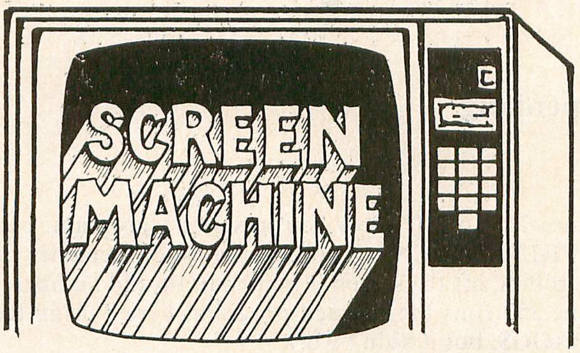

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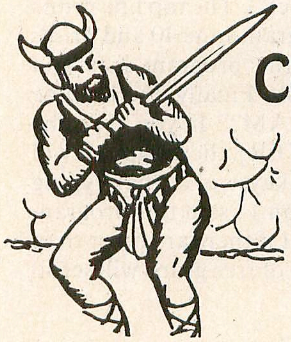

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Lazy Man's Disk Directory

By Ralph Delperdang

I have a 32K CoCo with a Radio Shack disk drive. It is a great system, but, as anyone who has one knows, the disk directory is unacceptable. If you have more than 14 files, you have to be fast on the [SHIFT] and @ keys. Being basically lazy, (If I wasn't lazy, why would I need a computer to do my work for me?) I wrote a program that will list up to 30 files on the screen at once.

Another problem with TRSDOS is it doesn't allow you to label your disks. My program fixes that too, and prints out the number of free grans on the disk.

To run the program, insert a disk with the program on it and type RUN"D (I named the program *D/BAS* to save keystrokes loading it. Lazy, remember?). The top line prints the name you give your disk in program Line 40 and prints the number of free grans. Next, the program lists and numbers the files that are on the disk. Finally, the last line asks you to "SELECT A PROGRAM?" If you type the number next to a program and [ENTER], the computer will run that program. (That is a lot less keystrokes than typing *RUN*, the filename, and the extension.) I said this program will display 30 filenames at once, but if there are more than 28, the name of the disk and number of free grans will scroll off the screen.

Line Descriptions

Line 10 clears space for the filenames.

Line 20 sets up the array for the filenames. If you have more files on the disk than the first number in the *DIM* statement (35 in my program), you will get a BS (subscript out of range) Error.

Line 40 names the disk.

Lines 50 to 180 get the filenames from track 17 on the disk and load them into the array. (This routine was inspired by Michael Plog's *Print Directory* program in the March '83 *Rainbow.*)

Line 160 allows me to selectively delete files from my directory by the extension name. In my case, my directory will not list any files with the extension "DAT." (I can't *RUN* a data file, so I don't list them.)

Lines 190 to 210 print the filenames on the screen.

Lines 215 to 240 allow you to select a program. I used "PRINT @ LCN" to prevent the list of filenames from scrolling off the screen if I enter an invalid number.

Line 250 runs the selected program. I tried using RUN PROG$, but it didn't work.

The listing:

```
120.....0111
END...030C
```

```
1 'D/BAS
10 CLEAR1000
20 DIMP$(35,2)
30 CLS
40 PRINT"DISK#1 RAINBOW 830815 :
";FREE(0);"FREE"
50 FORZ=3TO11
60 DSKI$0,17,Z,A$,B$
70 X$=A$:GOSUB110
80 X$=B$:GOSUB110
90 NEXTZ
100 GOTO190
110 FORJ=1TO128STEP32
120 R=R+1
130 P$(R,1)=MID$(X$,J,8)
140 IFLEFT$(P$(R,1),1)=CHR$(255)
THENR=R-1:GOTO190
145 IFLEFT$(P$(R,1),1)=CHR$(0)TH
ENR=R-1:GOTO170
150 P$(R,2)=MID$(X$,J+8,3)
160 IFP$(R,2)="DAT"THENR=R-1
170 NEXTJ
180 RETURN
190 FORK=1TOR
200 PRINTUSING"##";K;:PRINT")";P
$(K,1);"/";P$(K,2),
205 IFK=R THENPRINT,
210 NEXTK
215 LCN=480
220 PRINT@LCN,"SELECT A PROGRAM"
;:INPUTP
230 IFP<1ORP>R THENLCN=448:GOTO2
20
240 PROG$=P$(P,1)+"/"+P$(P,2)
250 LOADPROG$,R
```

(Ralph Delperdang is a captain in the U.S. Air Force and currently flies the RE-4 Phantom. He has an engineering degree from Iowa State University. His hobbies include the computer and he is working on making his children (and wife) computer literate.)

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Carl Meinke

By Mark Skala

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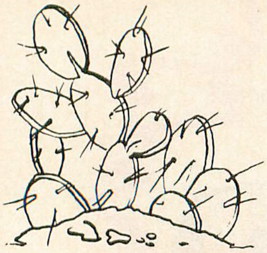

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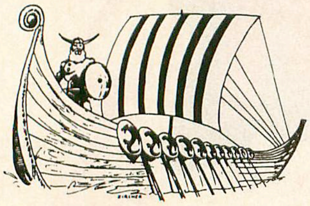

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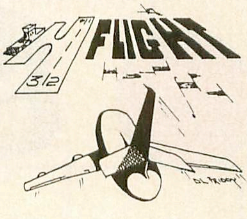

FLIGHT: Not *a game*, but a hi-res graphic landing simulator. Choose 4 levels of instrument or regular landings, with or without crosswinds. Needs 32K. B & ML. **Tape - $19.95, Disk - $24.95**

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(These are not games)

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TOPSY TURVY: Race against the clock to form as many words as possible from the letters you are given. Lots of bonus scoring for longer words. BASIC. **Tape - $19.95, Disk - $24.95**

NEW **DECIPHER:** For 1 or more players. Multiple players choose their words, while single players let the computer choose from hundreds stored in memory. You must unscramble the word or phase while the clock runs. This is the best available word game! 100% ML. **Tape $24.95, Disk - $29.95**

JOYSTICK GAMES

TEEEOFFF: The only really outstanding golf game for the color computer. All in hi-res, and you move your golfer (a little person) up to the ball and then control his backswing with the fire button. Very challenging, with water and sand - even giant cactuses. 1 to 4 players. 100% ML. **Tape - $24.95, Disk - $29.95**

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MONSTERS & MAGIC: Fight your way thru up to 50 different monsters using a realistic fantasy combat system (initiative - damage by weapon type - levels - etc.), and then try to defeat the dungeon lord. 1000+ place description combinations. For 1 player, needs 32K. BASIC. **Tape - $19.95, Disk - $24.95**

JUNGLE: Take a journey into trouble. This game gives Murphy's law new meaning, and in this magical jungle, many things are only illusions. A very nice game, and easy enough for the younger set. BASIC. **Tape - $19.95, Disk - $24.95**

ADULT GAMES

THE NAKED GAMER: Nothing obscene - just two great games in which the losers are told to remove items of clothing. One game is a fast moving joystick type, while the other is a logic game. These games are terrific even if you keep your clothes on! B & ML. **Tape - $21.95, Disk - $26.95**

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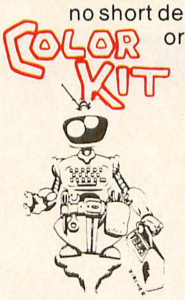


COLORKIT: What can we say about the absolute best state-of-the-art programmer's utility. This program adds 35 commands to BASIC that should have been there all along and no short description will do it justice. Summary - light or dark screen, keyclick, screen editor, programable keys, a super memory tool, variable listing, echo to printer, BREAK disable, convert machine language to DATA, global search, single step thru program run, double space printouts of program listings - that's less than half of what it will do. It takes about 6K of space, and if you have 64K you can put it up high and lose no BASIC space at all. 100% ML. Fully relocatable. **Tape - $34.95, Disk - $39.95**

APPLICATIONS

PRICKLY-PEAR MAILING LIST: This mailing list program will handle up to 1500 records per file and will sort by name or zip code. It searches on any field and all display is in a hi-res upper and lower case format. There is no better mail list program. Needs 32K and 1 disk drive. B & ML. **$49.95**

MUSIC BOX: Compose your music in 4 voices and let the harmony flow. You can assign any of 4 instruments to each voice, and the program is truly easy to use. 100% ML. **Tape - $24.95**

EIGHT-BIT BARTENDER: Over 100 drink recipes, and you can call them up by name, category, or main liquor. The author's liver risked death to bring you this program. Needs 32K. B & ML. **Tape - $19.95, Disk - $24.95**

HOUSEHOLD HELPER: This gem does recipe conversions, metric conversions, gasoline computations, and maintains a bills due file. A very friendly program. B & ML. **Tape - $19.95, Disk - $24.95**

NEW

SUPER ASTROLOGY: Everything our customers have written and asked for in an astrology program is here! This all new program by a new author gives accuracy to a few minutes of arc. Choose from tropical or sideral zodiacs, Heliocentric or Geocentric, and five different house systems - Placidus, Campanus, Regiomontanus, Koch, and Equal. Specify the orb for aspects, find any harmonic, and output the complete natal horoscope to the screen or printer. The program will handle progressed and transit charts with date manipulation. This program comes with complete and easy to follow instructions, sample chart forms, and a suggested reading list to aid in interpretation. Don't settle for a lesser program! Needs 32K. B & ML. **Tape - $24.95, Disk -$29.95**

EXPLANATION OF CODES

BASIC: This program is 100% BASIC. That means it is easy to examine and easy to modify. BASIC is the best language for some applications.

B & ML This program is written mostly in BASIC, but some routines are in machine language for more speed. May be harder to examine or modify than an all BASIC program.

100% ML This program is all machine language for fastest possible execution. Examination or modification will require a high skill level.

EDUCATIONAL PROGRAMS

PREREAD I, II, & III: This program uses graphics and voice from the tape to teach the alphabet three ways - by name, by sound, and by shape. B & ML. **Tape - $24.95, Disk (with voice tapes) - $29.95**

PHONICS I: Teaches all the consonant blends phonetically, using graphics and sound from the tape. B & ML. **Tape - $24.95**

PHONICS II: Like Phonics I, but teaches the consonant digraphs. B & ML. **Tape - $24.95**

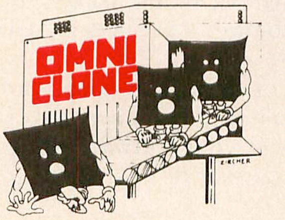
PHONICS I & II ON DISK: A package that includes both of the above in a disk format. Still has voice on tape. B & ML. **Disk only (with voice tapes) - $44.95**

NEW

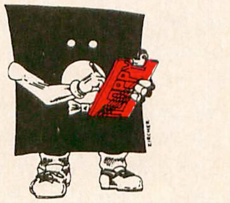
SPELLING: Six tapes provide voice testing and practice modes for the entire 220 word Dolch list which makes up 75% of all elementary written material. Eleven lessons, and the testing is by VOICE, just like in class. The disk version can be easily modified to include new words. B & ML. **Tape -$49.95, Disk (with voice tapes) - $54.95**

MATHPAC: Provides drill and positive reinforcement of addition, subtraction, multiplication, or division. Lots of extras for repeating, setting levels, and classroom use. **Tape - $19.95, Disk - $24.95**

DISK UTILITIES



OMNI CLONE: This program even amazes us. It backs up every color computer disk we have seen, and has even backed up disks for the Model 3 and IBM PC. Protect your valuable collection against loss with this super power backup utility. Easy to use. Needs 32K and at least one disk drive, but works with two drives if you have them. 100% ML. **$39.95**



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Copyrighting Your Software

Part 4

By Tom Nelson
***Rainbow* Contributing Editor**

The Merry Christmas season is upon us happy consumers. After this last article devoted to copyright question, I will begin a series devoted to helping the consumer. Just in time for the post-Christmas season.

This last article in the series on copyrighting your software will be devoted to helping you many software authors understand the mechanics of assigning or licensing your software. Maybe after this article some of that fine print will be more intelligible.

If you decide to have someone or some firm other than yourself market your software, there are two alternatives. You can either assign your rights in your software to the company, or you can license some or all of your rights in your software.

Assignment is tantamount to a sale of your software. You transfer your rights to manufacture, sell, make adaptations, etc., of your software, to the new company for a single, determinable amount of cash. For all intents and purposes you no longer have any rights in the software. Sure, under the copyright laws you may regain your rights after 35 years from the date of *transfer* by following certain rules, but by that time your software will be of little value.

Licensing, on the other hand, may not be so final. A license is a grant of certain rights in a work of authorship for a certain period of time, with ownership remaining with the author. When an author licenses his or her rights in a program, there is an almost unlimited amount of flexibility allowed. The license may be exclusive, that is, the company gets total control of the program; the license may also be non-exclusive, making the company only one of several marketing the product, or allowing the company only to market the software, but not make alterations. The license may also be a combination of the two. You may grant exclusive rights for one computer, but retain rights to adapt your software for other computers. The license may also be limited in duration, and any number of other ways.

Assignments and licenses also usually differ in the method of compensation. Assignments are usually obtained for a lump-sum payment, or a few installment payments. Licenses are usually granted for a certain percentage of the receipts for software sales or sub-licensing (the person licensing the program licenses his rights to another person), that is, royalties. Of course, assignments can be made for a determined sum to be paid out of receipts from the sale of sub-licensing of the software. These payments are often termed commissions rather than royalties. Licenses can also be granted for one lump-sum payment. This is frequently done in the computer industry.

The real difference between assignments and licenses, then, is the degree of control which the author retains. License agreements almost always contain certain restrictions in use, sale or sub-licensing of the program; assignment agreements rarely do.

So which should it be? The decision is partly yours. The considerations on your part, as always, are financial. Do you need a lump of money right now, or can make do with the advance on royalties offered and wait for the quarterly royalty check? Of course, the potential marketer of your software also will have a say. Obtaining an assignment of your software is costly, and the risk of your software being a flop will rest on the software house. Few software houses are willing to take such a risk in the volatile and unpredictable software market. Sure, they will own the rights to your software, but those rights may end up being worth far less than the lump-sum payment.

As a result, assignments are a rarity with outside programmers. (By contrast, employment contracts with in-house programmers will always contain assignment clauses, since the company paid for the development of the software already.) As in the book publishing industry, software houses prefer to have the author share the risk. The software house will usually provide an advance on royalties, depending on the potential of the program. This is a non-refundable payment which serves as initial compensation for and recognition of the work the author has expended to create the program. Any remaining payments will be based on sales. If the program sells well, both the author and the software house will reap the rewards; if the program flops, both will be lucky to recover the costs of creation and promotion.

Before going on to discuss the guts of assignment and license agreements, it would probably not hurt to discuss

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(Tom Nelson was formerly a special assistant attorney general for the State of Minnesota. He currently is general counsel for Softlaw Corporation, makers of the ***VIP Library™****, and of* ***ColorQuest™*** *games.)*

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some basic economics of marketing software. First, the author's point of view.

Program development can take anywhere from a month or so to several years. As the market becomes more sophisticated, the development time increases, since the features expected by the consuming public grow in quantity and quality. Development costs include the amount of effort devoted to the particular piece of software and the price of the developmental tools used to create it. Another important cost is any opportunity lost because of the effort used to develop your software. Based on these costs you've taken the risk, you have an idea of what it cost, and you hope to obtain a certain return on your risk "capital," be it 10 percent or 1000 percent.

Software houses incur marketing costs immediately. In fact, depending on the program, these initial marketing costs can be quite substantial. Let's look at the marketing of a good game. Games sell best when advertised with four-color, full-page ads. The cost to run such an ad in one magazine can run from a rock bottom of $500 in a not-so-desirable magazine to perhaps $2,500—and this is magazines for the Color Computer. Magazines for other computers are even more expensive, some even going up to $10,000 per page per month. The cost of ad space generally depends upon the circulation figures.

That's just the advertising monthly rate for only one of the several magazines the software house may have to use. To get an ad with the four colors is another substantial initial investment. First there's the painting, then the separations, then the typesetting, layout, color key, transparencies—soon you've spent $1,000 or more before anyone has even seen the ad. And to be successful, there usually is some media hype and enticements to dealers. Tack on to this the advance for the author, and the costs, just to get the game off the ground, are around $5,000.

Of course, not all new software gets such expensive treatment, but all authors should carefully consider such costs when dealing with a software house, and be prepared to discuss promotion. These costs will affect both the rate of royalties and the size of any advance.

Assignment agreements are usually very simple. "I'm giving you this for $ X," period. They can get more complicated if there are commissions, and they usually include standard clauses which differ little from those in license agreements.

License agreements. Oh boy! I've got a million of 'em. Since I discussed general contract structure in a previous column, here we only need to discuss those terms customary to a license agreement.

First things first. What are you giving up? The right to market and adapt your software? Only the right to market? Only for one computer? For all time? For two months? The questions of the coverage and duration of your license are areas for negotiation. There is no stock formula, although software houses are only willing to bargain within certain limits. Most software houses want exclusive rights for at least one computer, and often want the right to adapt for other computers. The duration varies, but usually is not less than three years for games and five years for utilities. The difference is due to the shorter "lifespan" for games in the marketplace.

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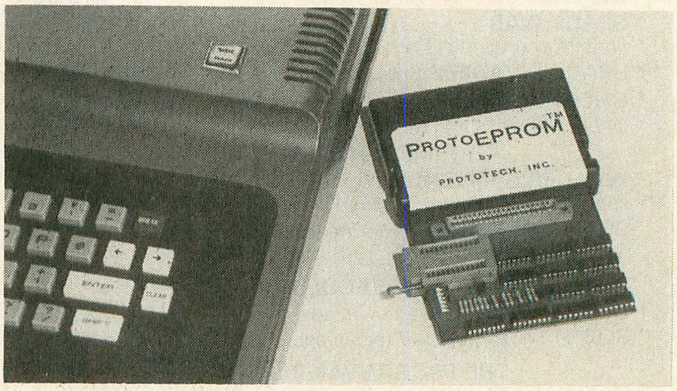

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Next, the financial terms. Any advance and the exact royalty rate must be worked out. In addition to the considerations discussed above, other elements enter in. Newer software houses which are less well known generally will be willing to offer higher royalties. More established houses which can virtually guarantee a dealer network and a well-known name tend to offer lower royalties. Sad to say, original games, which sell less well, fetch lower royalties than "knock offs." Thus, royalties vary from six percent or lower to up to 25 percent or more. The general rate, however, is between 10 and 20 percent, with the exact amount depending on the type of program. (Compare this to the standard six percent for the book publishing industry.)

But what is a royalty rate? Twenty-five percent for one company may be equal to 10 percent for another, since each may apply the percentage to a different figure. It is how the royalty rate is determined which should really concern you. A very well-known manufacturer of another computer uses the following clause in its license agreement for computing royalties as a percentage of the "net receipts:"

> For the purpose of computing royalty payments under paragraph two, "net receipts" shall mean the base price received by the company for the software. The base price of the software does not include the cost of diskettes, cassettes, cartridges or other media ("Media"), handling, production costs, packaging, documentation, promotion, taxes or duties. Refunds allowed by the company to customers upon returns of Media (containing the software) will be deducted in determining "net receipts." If Media containing the software is marketed as a package with other programs, new receipts will be allocated by the company on a pro rata basis among the programs in the package based on the bare price of each of the programs.

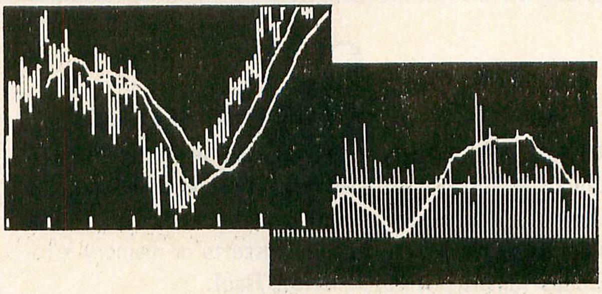
This type of royalty computation formula is fairly common. Royalties are computed not on gross receipts, but on net receipts, determined by subtracting certain costs. So get out your pencil and paper (or VIP Calc) and calculate exactly how much you will be getting for each copy sold. Don't forget also that you want to get royalty payments fairly frequently, say quarterly.

Once you have the money portion determined, don't forget to include a clause allowing you to have an accountant inspect the books for discrepancies, such as:

> I have the right to have the payment calculations verified once a year, at my expense. Verification shall consist of examination of pertinent records by a certified public accountant of my choice and approved by the company who must execute a confidential disclosure agreement provided by the company and who may not disclose any information to me other than his opinion as to the accuracy of the payments.

This clause protects both your interest in assuring accurate payments and the software house's interest in maintaining the confidentiality of its financial information.

Beyond the financial terms, you will want to look out for clauses dealing with future adaptations, marketing strategy, warranty and indemnification. The software house will



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insist on the right to control all aspects of the marketing of the product. It will also need the right to modify the program in case of a name change, a new bug, or whatever. The software house will require that the author state that he or she is the true author of the program, and that the program is original work. Another common clause requires the author to agree to pay for any lawsuit arising from a copyright infringement action brought about the game, usually to the extent of any royalties paid and owing. This protects the software house against attempts by authors to pass off "knock offs," or stolen programs. Finally, the software house will want to be able to require the author to make certain changes if problems, functional or aesthetic, arise with the program.

You, the author, will want to make sure that a clause is included allowing you to terminate the agreement if the program is not marketed within a certain period of time, say six months, or if your royalty payments are over 60 days past due. You might also have other terms which you wish to include, or you might wish to modify clauses of the agreement. Get your negotiating shoes on.

Beyond this, the usual boiler plate clauses relating to assignment (the author can't and the software house can), applicable law, and so on are included. See my previous column for a discussion of these clauses. Of course, the agreement is wide open for modification, so don't feel that the first written proposal is the final word.

Once you are satisfied with the contract, you should sign it. If you make any modifications to the proposed license agreement, you must place your initials next to the modification, even if it is only one character. Then send it in. Remember, if you want something in the agreement, it has to be in the agreement. If you are including part of a letter, or a conversation, those things must be written down and incorporated in the agreement. If not, a standard "merger clause" will limit the agreement to what has been contained in it, and all those phone conversations and letters will be of no effect.

Here I should say a bit about consummating contracts. The party who first signs the contract is the "offeree." Once an offer is made, it can be accepted by the other party by his or her signature and delivery or deposit in the mails. (With option agreements, common in the industry, the acceptance must not only be posted, but it must be *received* by the offeree within the set time period for the contract to be consummated.)

Usually software houses send unsigned forms. This makes you the offeree when you sign and return the forms. They then have the option of accepting the contract. You may withdraw your offer at any time before the other party accepts it, but the other party must *received* your withdrawal notice before he or she accepts. Your withdrawal notice should be in writing; a phone call is hard to prove, and may be legally insufficient.

As you can see, creation and consummation of your license agreement can become quite complicated. As always, I would highly recommend that you take the agreement and any proposed modifications to an attorney. The small sum you pay will both protect your interests and educate you about this intricate legal area.

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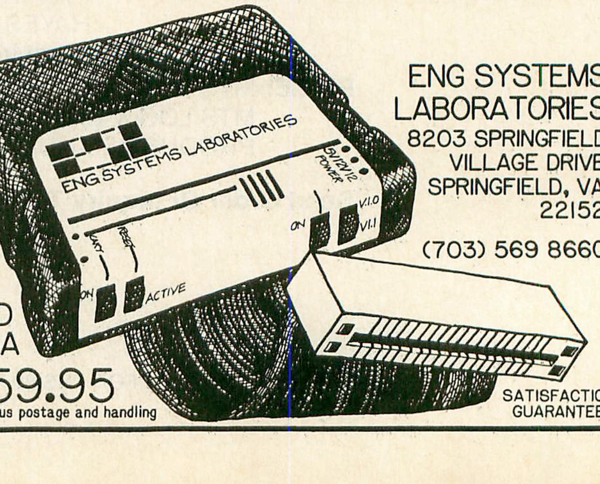

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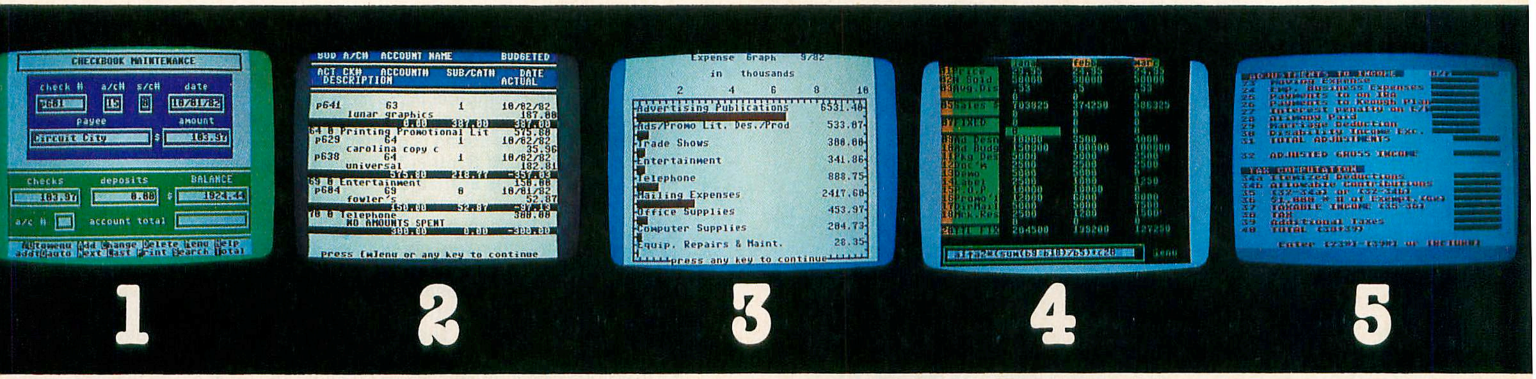

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check #   a/c#   s/c#   date
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payee                   amount
Circuit City          $ 103.97
checks      deposits      BALANCE
103.97      0.00        $ 1924.44
a/c #       account total
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ACT CK#   ACCOUNT#   SUB/CAT#      DATE
DESCRIPTION                      ACTUAL
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     lunar graphics              187.00
64 0 Printing Promotional Lit    575.00
p629      64         1         10/02/82
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p684      69         0         10/01/82
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   in   thousands
    2     4     6     8     10
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Ads/Promo Lit. Des./Prod       533.07
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press any key to continue
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actual screen display   *indicates function being shown

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- User controls Vibrato pattern, Bender Rate and Attack Mode.
- User modifiable attack, sustain, decay and release rates allow virtually any ASDR envelope.
- Fifty stops available. All may be changed and renamed by the user and saved for later use.
- Can be fine-tuned to match other instruments or other Color Computers. You could start a band!
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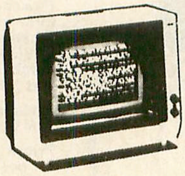

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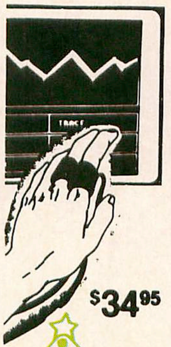

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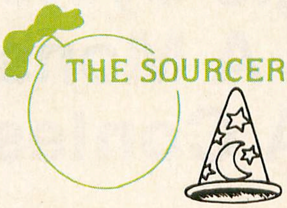

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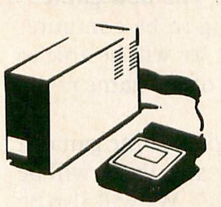

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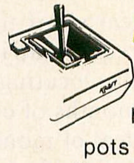

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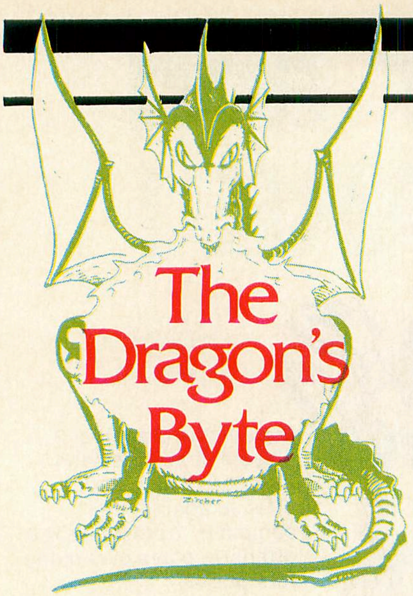

Details Of A Magic System (And A Monster Of A Contest)

By Bill Nolan
Rainbow Contributing Editor

As most of you know, we have been working on a new fantasy game for several months. The new game is being designed from the beginning to be computer assisted wherever possible, and as a result we will be able to make the combat system and other facets of the game much more realistic and complete.

Last month we gave you a general overview of the game at its current stage of development, and this month we will be examining the magic system in greater detail. We will also be talking about the details of the monsters and the spells, and if you read a little further you will find a contest relating to these last two items and offering over $400 in prizes!

First, though, let's look at the various colors of magic. You will recall from last month that player characters in the Arcanist, Guardian, and Champion classes must dedicate themselves to one of three colors of magic — white, black, and green.

These three colors represent different faces of the same force, and are *not* to be viewed as hostile to one another. Think of them as different ways to the same truth. For this reason, there is no restriction as to which of these colors can campaign together.

All of these colors of magic are related to nature. The white draws its power from the light and air, from the sun, and from the light and intellect. The black draws its strength from the power of death and darkness, from the moon, and from the spirit of anger. The green finds its source in all life, in growing things, and in love. Each has its particular strengths and weaknesses. For example, green magic will never cause death and only practitioners of the black can create poison.

Non-player characters use other colors of magic, and these other colors — red, orange and brown — are very hostile to the white, black, and green. In addition to this, Dragons use clear magic, about which nothing is known at all. This would be a good area for an aspiring wizard to research.

As we mentioned last month, there are three kinds of magic. Trivial spells are little things like push, pull, create fire, and other spells which are of pretty minor use and power.

Battle magic is a group of spells usable by a warrior during a fight. These spells are instant in use and the fighter can still attack that round. An example is "weapon in hand." To see the utility of this, watch Luke Skywalker in Star Wars when he drops his light sabre. He just holds out his hand and the weapon flies into it. That's weapon in hand. Other battle magic spells are disarm, hesitation, jump, mirror image, and trip.

The third type of spells are the regular spells, and these are found in various power levels just like you are used to in other games. These are also found in versions usable by arcanists and guardians, and one class cannot cast spells of the other class. Of course, Champions can cast spells from both classes, but only of the lower power levels.

Arcanists, Guardians, and Champions are assumed to start out knowing the magic language. Other classes must learn it if they want to be able to cast spells. To learn it requires an intelligence score of at least nine. It also requires the locating of a teacher willing to teach it and several months of concentrated study. It will certainly cost a great deal of money!

Keep in mind that once you learn a spell you know it, and do not have to re-memorize it each day. However, the total spells you can cast each day is based upon your force points, and if you try to cast a spell and fail, the force points are still deducted. Also keep in mind that saving throws are based on current force points, not starting force points, so if your force points are depleted you will find it harder to make a saving throw.

Last month I mentioned that if you try to cast a spell and miss by 25 percent or more, you must roll on the dreaded spell misfire table. The percentage you need is given in last month's column, and here is the dreaded table itself. If you fail your percentile roll on casting the spell, roll a 30-sided die and look up the result on the table.

The Dreaded Spell Mis-Fire Table

1) Spell affects caster, or if that was the intent, affects

(Bill Nolan teaches computer science at a local college, moderates a fantasy game once a week, and is a principal in Prickly-Pear Software)

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*RAINBOW REVIEW DATES

*JAN '83

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*OCT '82

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*JUNE '82

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*RAINBOW REVIEW DATES

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*SEP '82

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*MAY '82

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ALL PROGRAMS require Extended Color Basic and are delivered on cassette. All, except Tape Date-O-Base Calendar, are DISK System compatible.

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RAINBOW
CERTIFICATION
SEAL
ALL LISTED
PROGRAMS

someone nearby.
2) Spell effects are permanent.
3) Caster loses 2D10 of force points — recover at one per day.
4) Caster loses 1D10 of force points — recover at one per day.
5) Same as 4.
6) Same as 4.
7) No effect.
8) No effect.
9) No effect.
10) No effect.
11) Caster takes 2D10 of damage.
12) Caster takes 1D10 of damage.
13) Same as 12.
14) Same as 12.
15) Same as 12.
16) Spell effects reversed.
17) Spell effects reversed.
18) Area effect spells are triple normal area — roll again for non-area spells.
19) Same as 18, but effect area is doubled.
20) Spell affects wrong area or person — roll to see where or who.
21) Same as 20.
22) Same as 20.
23) No effect.
24) No effect.
25) Spell duration halved if applicable, otherwise roll again.
26) Spell area halved if applicable, otherwise roll again.
27) Spell drains double force points.
28) Spell drains triple force points.
29) Spell drains one-half normal force points.
30) Spell wiped from memory.

Now, on to the contest. We are in need of original spells and monsters for this game. The specifications of each are given below. If you submit a spell or monster used in the column you will receive a Prickly-Pear Software four-color, screened dragon T-shirt worth $9.95. In addition, the person who submits the entry we judge to be the best in each category—spells and monsters—will receive a gift certificate for $50 from Prickly-Pear Software and a gift certificate for $50 from Sahuaro Software. The second place winner in each category will receive a $50 gift certificate from Prickly-Pear Software. (I was able to arrange these prizes with Prickly-Pear because I know the owner of the company.)

For spells you will need to specify the name of the spell, materials and time needed to cast it, range of the spell, area or number of people affected, the exact effect of the spell, whether or not the victim gets a saving throw, and, if a saving throw is allowed, what will happen if it is successful. The more detail you put in, the better, and the more original the spell is, the more chance you will have to win.

For the monsters we need a very complete physical description with a sketch if possible. We also need to know the usual stats such as speed, size, attack mode, number of attacks, intelligence, special attacks or defenses, and the damage multiplier. If you recall, the damage multiplier is used with our combat system to compute damage.

For reference, a fist is a multiplier of .5 and a long sword is a multiplier of 1. Our monsters are level instead of hit dice or other systems, and you will have to specify a range of hit points. Bear the following in mind: Hit points do not vary a great deal with level in this game. Instead, a character or monster becomes harder to hit at higher levels because of the combat system (which was presented in an earlier issue). The hit point range should be set by the size and toughness of the critter, not the level. As with spells, the more detailed and original your monster, the better your chance to win will be.

This contest will continue through the 20th of January, with the winners being announced in the April issue of *the Rainbow*. (Copy for the April issue is due February 1.) Send your entries to: Contest, Bill Nolan, 9234 E. 30th Street, Tucson, AZ 85710. *Be sure* to mail them so we get them no later than January 20, 1984. All entries become the property of Bill Nolan.

I want to apologize to all of you for accidentally running the same program two months in a row in my column. The fault was mine, not *the Rainbow's*. The program that ran twice was the first stage character generating program, and the one I was supposed to send last month was the new improved character generating program. The correct program is listed below. If you have already typed in the other character generating program, this one is not different, it is only longer. The other program ended when you rolled up your basic characteristics, while this one continues on. If you already have the other one in your computer just go through it and add the necessary lines. Also, check the existing lines, as a few of them have been changed a bit (mostly added on to). If you typed in last month's program you have about half of this one done. This program figures out almost everything you need to create a character for the new game. See you next month, and have a very Happy Holiday.

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BIRD - TREE -

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3 - ? 2 - ? 1 - ?

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```
124.....0260   1150... 0A0F
240.... 04F2   2005...0CD5
1087....0715   END... 0ECF
```

The listing:

```
5 X=RND(-TIMER)
10 DIM C(8),C$(8),CL(10),CL$(10)
20 FOR X=1 TO 8:READ C$(X):NEXT
100 CLS:PRINT" PRESS ANY KEY TO
ROLL":K$=INKEY$:GOSUB 9000:PRINT
" COMPUTING ROLL";:GOSUB 199
110 CLS:FOR X=1 TO 8:PRINTC$(X),
C(X):NEXT X
112 CC=0
115 IF C(1)>9 AND C(2)>9 AND C(4
)>7 AND C(5)>8 AND C(6)>9 AND C(
7)>8 AND C(8)>8 THEN PRINT" ROGU
E",:CC=1:CL(1)=1:CL$(1)="ROGUE"
118 IF C(5)>6 AND C(7)>8 AND C(8
)>8 THEN PRINT" WARRIOR",:CC=1:C
L(2)=1:CL$(2)="WARRIOR"
120 IF C(2)>7 AND C(4)>7 AND C(5
)>8 AND C(6)>9 THEN PRINT" THIEF
",:CC=1:CL(3)=1:CL$(3)="THIEF"
122 IF C(2)>9 AND C(3)>8 AND C(6
)>8 AND C(7)>7 THEN PRINT" ARCAN
IST",:CC=1:CL(4)=1:CL$(4)="ARCAN
IST"
124 IF C(2)>8 AND C(3)>11 THEN P
RINT" GUARDIAN",:CC=1:CL(5)=1:CL
$(5)="GUARDIAN"
126 IF C(2)>9 AND C(3)>10 AND C(
4)>9 AND C(5)>9 AND C(7)>9 AND C
(8)>9 THEN PRINT" CHAMPION",:CC=
1:CL(6)=1:CL$(6)="CHAMPION"
127 IF CC=0 THEN PRINT" COMMONER
",:CL(7)=1:CL$(7)="COMMONER"
128 IF C(1)>10 AND C(2)>9 AND C(
5)>9 AND C(6)>9 THEN PRINT" ELF"
,:CL(8)=1:CL$(8)="ELF"
129 IF C(8)>7 THEN PRINT" DWARF"
,:CL(9)=1:CL$(9)="DWARF"
130 PRINT:PRINT"PRESS 'R' TO RER
OLL OR 'G'":PRINT"TO GO ON.";:K$
=INKEY$
140 K$=INKEY$:IF K$<>"R" AND K$<
>"G" THEN 140 ELSE SOUND 150,1:I
F K$="R" THEN RUN
150 GOTO1000
199 FORC=1TO8:C(C)=0:FORC=1TO8:D
1=RND(4):D2=RND(4):D3=RND(4):D4=
RND(4):D5=RND(4)
200 HH$(1)=STR$(D1):HH$(2)=STR$(
D2):HH$(3)=STR$(D3):HH$(4)=STR$(
D4):HH$(5)=STR$(D5)
210 FOR X=1 TO 4:IF HH$(X)>HH$(X
+1) THEN 250
220 NEXT X
230 C(C)=(VAL(HH$(3))+VAL(HH$(4)
)+VAL(HH$(5)))
240 PRINT".";:NEXT C:RETURN
250 X$=HH$(X):HH$(X)=HH$(X+1):HH
$(X+1)=X$:GOTO210
1000 CLS:PRINT:FOR X=1 TO 7
1010 IF CL(X)>0 THEN PRINTX;".
";CL$(X)
1020 NEXT X:PRINT
1030 PRINT"SELECT CLASS"
1040 K$=INKEY$:K=VAL(K$):IF K<1
OR K>7 OR CL(K)<1 THEN 1040 ELSE
 SOUND 150,1
1050 CLS:PRINT:CL(10)=1:CL$(10)=
"HUMAN":FOR X=8 TO 10
1060 IF CL(X)>0 THEN PRINT X;".
";CL$(X)
1070 NEXT X:PRINT
1075 INPUT"SELECT RACE";R
1080 IF R<8 OR R>10 THEN 1075
1081 IF CL(R)<1 THEN 1075 ELSE S
OUND 150,1
1085 PRINT:INPUT"INPUT THE LEVEL
";PL:PRINT:PRINT"WHICH SEX? (M/F
)":K$=INKEY$
1086 K$=INKEY$:IF K$<>"M" AND K$
<>"F" THEN 1086 ELSE SOUND 150,1
:IF K$="M" THEN PS=1 ELSE PS=2
1087 GOSUB 9600:GOSUB 9700:CLS:P
RINT:HP=C(3)+C(7)+C(8)+(PL-1):PR
INT"HIT POINTS =";HP
1088 FP=C(3)+C(2)+C(7)+(PL*3):PC
=(C(5)+C(8)+PL)*3:FD=(C(2)+PL)*2
:FT=(C(2)+C(6)+PL)*2:PRINT:PRINT
"FORCE POINTS =";FP:PRINT:PRINT"
CLIMBING CHANCE =";PC:PRINT:PRIN
T"FIND SECRET DOORS CHANCE =";FD
:PRINT:PRINT"FIND/REMOVE TRAPS C
HANCE =";FT
1089 PRINT:PRINT"PRESS A KEY TO
CONTINUE":K$=INKEY$:GOSUB 9000:S
1=(C(2)*3)+(C(3)*3)+((PL-1)*10):
S2=(C(2)*5)+(C(6)*3)+C(3)+((PL-1
)*10):S3=(C(2)*3)+(C(3)*5)+((PL-
1)*10)
1090 CLS:ON K GOTO 1100,1200,130
0,1400,1500,1600,1700
1100 PRINT:PRINT"COMBAT ADJUSTME
NT = 6":PRINT:PRINT"STARTING SPE
LL CHANCE =";S1:PRINT
1110 LP=30+((PL-1)*5):IF C(6)>10
 THEN LP=LP+5 ELSE IF C(6)>11 TH
EN LP=LP+15
1120 PP=LP
1130 ST=40+((PL-1)*5):IF C(2)=>1
0 THEN ST=ST+5
1135 IF C(5)>10 THEN ST=ST+5 ELS
E IF C(5)>11 THEN ST=ST+10
1140 HI=ST-10
1150 PRINT"LOCK PICKING CHANCE =
";LP:PRINT"POCKET PICKING CHANCE
 =";PP:PRINT"STALKING CHANCE =";
ST:PRINT"HIDING CHANCE =";HI:PRI
```

```
NT:GOTO9500
1200 PRINT:PRINT"COMBAT ADJUSTME
NT = 6":PRINT:PRINT"STARTING SPE
LL CHANCE =";S1:PRINT:GOTO 9500
1300 PRINT:PRINT"COMBAT ADJUSTME
NT = 3":PRINT:PRINT"STARTING SPE
LL CHANCE =";S1:PRINT:GOTO 1110
1400 PRINT:PRINT"COMBAT ADJUSTME
NT = 0":PRINT:PRINT"STARTING SPE
LL CHANCE =";S2:PRINT:GOTO9500
1500 PRINT:PRINT"COMBAT ADJUSTME
NT = 2":PRINT:PRINT"STARTING SPE
LL CHANCE =";S3:PRINT:GOTO 9500
1600 PRINT:PRINT"COMBAT ADJUSTME
NT = 6":PRINT:PRINT"STARTING SPE
LL CHANCES:":PRINT"  TRIVIAL OR
BATTLE MAGIC =";S1:PRINT"  REGUL
AR ARCANIST SPELLS =";S2:PRINT"
 REGULAR GUARDIAN SPELLS =";S3:P
RINT:GOTO 9500
1700 PRINT:PRINT"THIS IS A COMMO
NER":PRINT:PRINT"COMBAT ADJUSTME
NT = 0":PRINT:PRINT"CANNOT RISE
IN LEVEL":PRINT:GOTO9500
2000 CLS:PRINT"ROLLS ADJUSTED FO
R RACE AND SEX":PRINT:FOR X=1 TO
 8:PRINTC$(X),C(X):NEXT X
2005 PRINT:PRINT"CLASS = ";CL$(K
):PRINT"RACE = ";CL$(R):PRINT"LE
VEL =";PL,:IF PS=1 THEN PRINT"MA
LE" ELSE PRINT"FEMALE"
2010 PRINT:PRINT"MORE CHARACTERS
?  (Y/N)";:K$=INKEY$
2020 K$=INKEY$:IF K$<>"Y" AND K$
<>"N" THEN 2020 ELSE SOUND 150,1
:IF K$="Y" THEN RUN ELSE END
9000 IF INKEY$="" THEN X=RND(0):
GOTO 9000:ELSE SOUND 150,1:RETUR
N
9500 PRINT"PRESS A KEY TO CONTIN
UE":K$=INKEY$:GOSUB 9000:GOTO 20
00
9600 IF PS=2 THEN C(8)=C(8)-2:C(
6)=C(6)+2
9610 RETURN
9700 ON R-7 GOTO 9710,9750,9799
9710 C(8)=C(8)-1:C(7)=C(7)-1:IF
C(8)>8 THEN C(8)=8
9720 IF C(7)>8 THEN C(7)=8
9730 RETURN
9750 C(1)=C(1)-1:C(4)=C(4)-1:IF
C(1)>8 THEN C(1)=8
9760 IF C(4)>8 THEN C(4)=8
9799 RETURN
10000 DATA PHYSICAL BEAUTY,INTEL
LIGENCE,FAITH,SPEED,AGILITY,MANI
PULATION,STAMINA,STRENGTH
```

The KEY-264K is here!!

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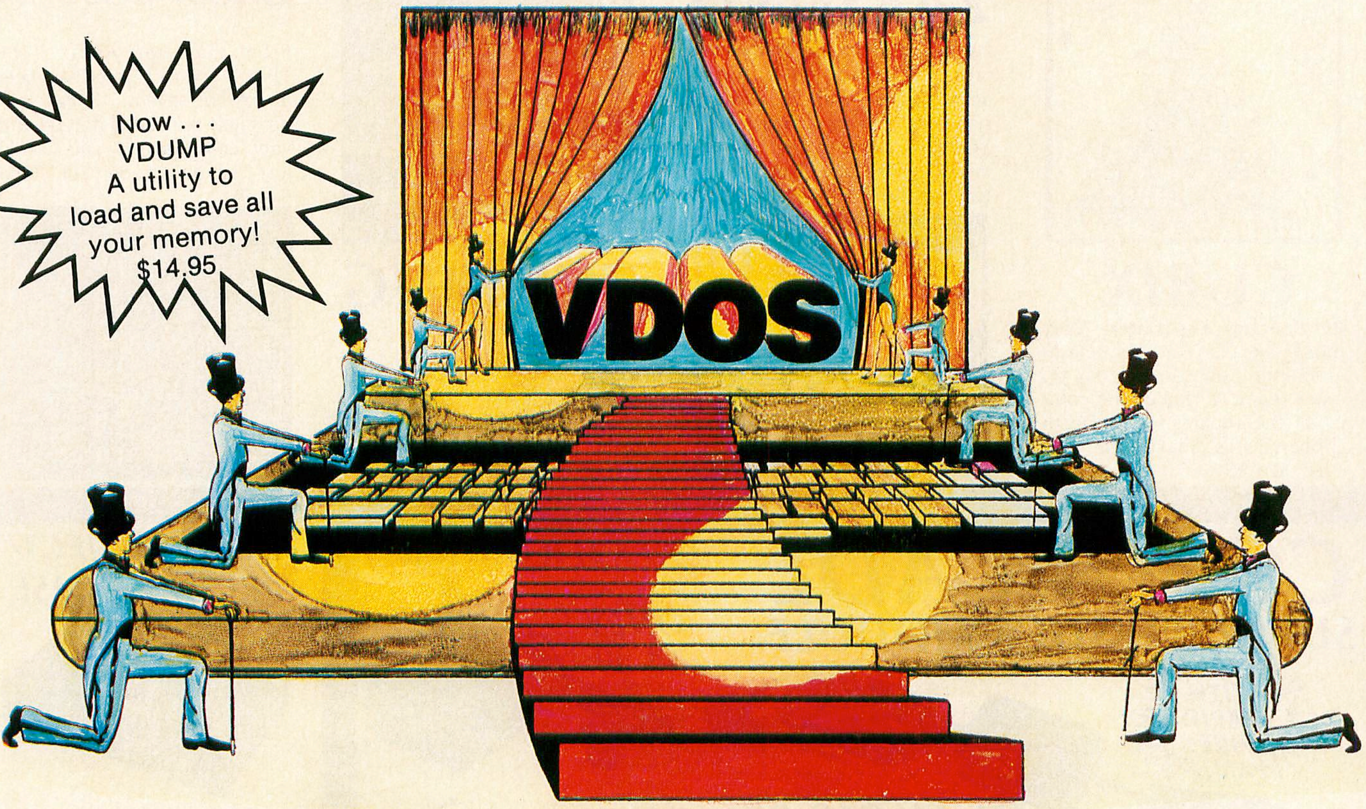

UN-BELIEVABLE

But true! There *is* a disk drive in your Color Computer . . . and it is faster and more efficient than any "hardware" drive you can buy, for any price. This new "disk drive" is called VDOS—for Virtual Disk Operating System—and it will absolutely revolutionize the way you operate your CoCo.

VDOS lets you use the "extra" memory inside your CoCo as a virtual disk, with programs (any programs) stored out of the way. You can "save" and "load" programs from your in-memory disk into working memory, and then run them. When you're done, you can simply access your in-memory disk again . . . and save or load another, and another.

And VDOS is fast. Because you are using memory rather than a mechanical device (like a disk drive or cassette player), programs load instantly. Yes, VDOS is faster than a disk!

VDOS works with all Color Computers—from 16K non-extended to 64K extended. Obviously, the more memory you have, the greater number (and length) of programs you can store. For a 64K system, VDOS also uses the "unused" part of memory, providing up to 50,000 bytes of storage! Now, that's some disk!

We call it VDOS because in the future there will be utilities for your VDOS UNDISK that will give even greater capabilities—such as a full one-pass memory dump to cassette. Other utilities are planned, too.

We believe VDOS is the greatest advancement for CoCo since the introduction of the disk drive itself. And, at less than $100, it is so inexpensive you can't afford to be without it. If you have the "cassette blues," VDOS *is* the answer!

Finally, VDOS is simple to operate. It is entirely self-prompting and comes with a complete manual. But you almost don't even need the instructions—it requires absolutely no technical expertise.

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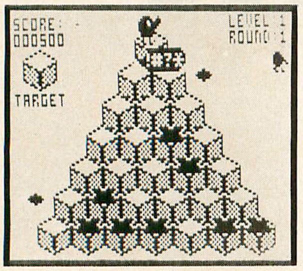

CUBIX

By Spectral Associates. Very much like the arcade smash! Jump little Cubix around the 3D maze trying to change the color of all the squares. With Death Globes, Discs, Snakes, etc. 32K Tape: $24.95

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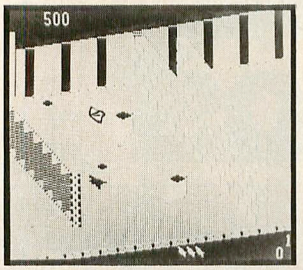

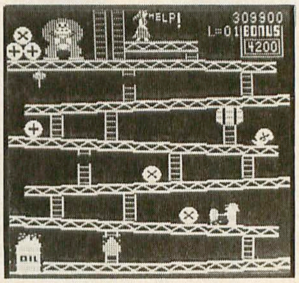

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Previously called 'Donkey King', you simply cannot buy a more impressive game for your CoCo. With 4 different screens and loads of fun! From Tom Mix Software. 32K Tape: $25.95

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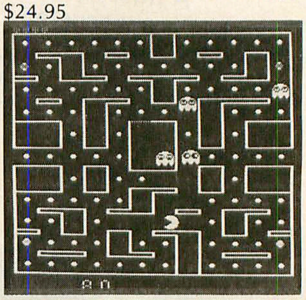

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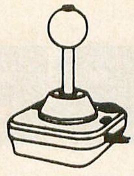

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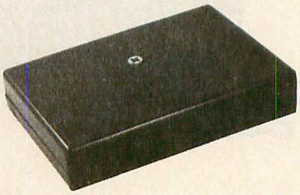

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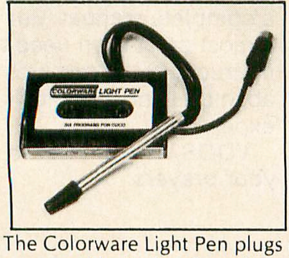

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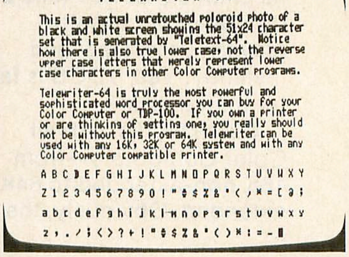
TELEWRITER-64



```
TELEWRITER-64

This is an actual unretouched poloroid photo of a
black and white screen showing the 51x24 character
set that is generated by "Teletext-64".  Notice
how there is also true lower case, not the reverse
upper case letters that merely represent lower
case characters in other Color Computer programs.

Telewriter-64 is truly the most powerful and
sophisticated word processor you can buy for your
Color Computer or TDP-100.  If you own a printer
or are thinking of getting one, you really should
not be without this program.  Telewriter can be
used with any 16K, 32K or 64K system and with any
Color Computer compatible printer.

A B C D E F G H I J K L M N O P Q R S T U V W X Y
Z 1 2 3 4 5 6 7 8 9 0 ! " # $ % & ' ( , * = [ @ ;
a b c d e f g h i j k l m n o p q r s t u v w x y
z , . / ; < > ? + ! " # $ % & ' ( ) * : = - █
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DISK $59.95
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FREE TEXT-TO-SPEECH

Included free with 'Real Talker' is Colorware's remarkable Text-to-Speech program. This is a truly powerful machine language utility. What it does is automatically convert plain English to speech. And it has an unlimited vocabulary! For example, use it in the direct mode: Type in a sentence or a paragraph, even mix in numbers, dollar signs, etc., then press enter. The text is spoken. At the same time a phoneme string is generated which can be saved to cassette or disk, modified or used in a Basic program.

We originally planned to sell this major piece of programming for about $40.00 but decided it was so useful that no 'Real Talker' user should be without it. Besides, it really shows off the capability of 'Real Talker'.

Also included with 'Real Talker' is our unique Phoneme Editor program. It allows you to explore and create artificial speech at the phoneme level. Phenomes are the fundimental sounds or building blocks of word pronunciation. There are 64 different phenomes, as well as 4 inflection levels at your disposal. Creating and modifying speech at the phenome level is both fascinating and educational. The Phenome Editor may also be used to customize the pronunciation of speech produced by the Text-to-Speech program.

You don't have to use any of our utility programs though. If you write your own Basic Programs, you will find the pocket sized Votrax Dictionary (included free) is all you need to make your own Basic programs talk. This dictionary gives you quick access to the phenome sequences used to create approximately 1400 of the most used words in the English language.

How about compatibility? 'Real Talker' is compatible with any 16K, 32K, 64K, Extended or non-extended Color Computer. It works with any cassette or disk based system, with or without the Radio Shack Multi-slot expander. No other synthesizer under $100 can make this claim. Most other CoCo voice synthesizers require an expensive Multi-slot expander in order to work with the disk system. 'Real Talker' requires only an inexpensive Y-adapter. This is an important consideration if you plan on adding a disk or have one already.

'Real Talker' comes completely assembled, tested and ready to use. It is powered by the CoCo and talks through your T.V. speaker so there is nothing else to add. Price includes Text-to-Speech and other programs on cassette (may be transferred to disk), User Manual and Votrax Dictionary. ONLY $59.95

'Y-BRANCHING CABLE' For disk systems. This 40-pin, 3 connector cable allows 'Real Talker' to be used with any disk system $29.95

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Order yours today on our Toll-Free Order Line. If you are not delighted with your 'Real Talker' system, simply return it within 30 days for a prompt, courteous refund.

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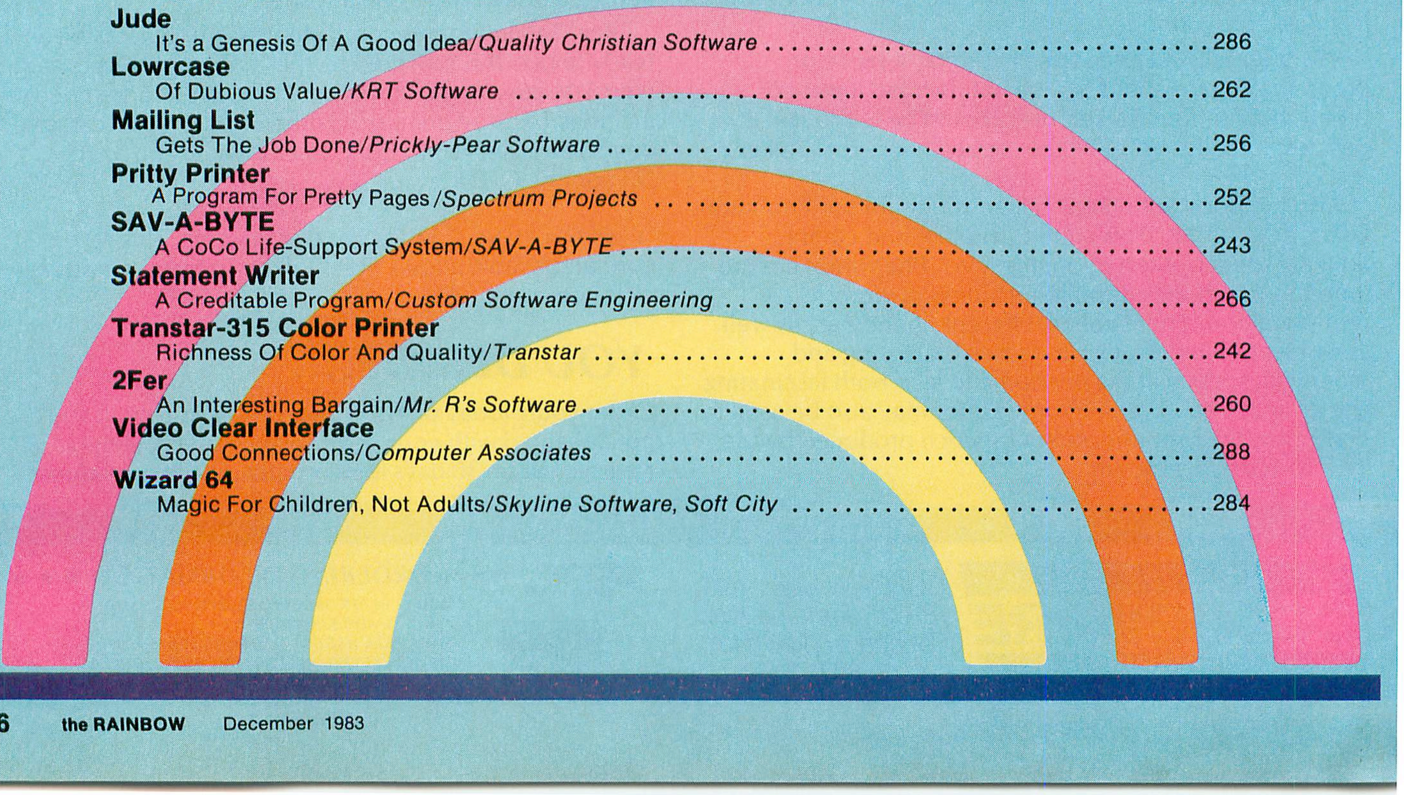

reviewing REVIEWS

KALEIDOPHONE

Editor:

Thanks for reviewing our *Kaleidophone* hardware in your October issue. The instructions *were* a bit confusing, and have since been rewritten.

Unfortunately, the reviewer didn't seem to realize that the software he described was only our (free) KP-83 *demonstration system.*

The very first paragraph of the (now infamous) instructions states that "[KP-83] is mainly intended to demonstrate . . . the hardware" and that it "only scratches the surface of the display possibilities."

The next paragraph explains how to obtain our "user" system, *Kaleidophonics 1984* ($15). It includes five separate menus with 26 items each. Any of these displays can be chosen "on the fly" with a single keystroke. BASIC, Extended BASIC, and all the unimplemented graphics modes can be used, including several 9-K modes unavailable anywhere else.

And you don't even need the hardware! (which is now only $35) The system will run with joystick input only, and can do spectral displays from cassette music tapes. In addition, it's fully programmable. You can create new displays or machine language routines simply by typing a list of letters.

We are so confident of the quality of this software that we offer it with a money-back guarantee. Of course, it's not perfect, but we thank you'll find it's the most powerful video music system available at any price.

Fred K. Lenherr
New Salem Research

FURY

Editor:

We at Computer Shack had reached the same conclusions as your reviewer did (October 1983, Page 256) and we have changed *Fury* so that now in the 32K version you can toggle both the voice and the heat seeking mines on and off.

Any previous purchasers of the game can get the newer version by returning the old game and $5 for the update and $3 for shipping and handling.

Gordon Monnier
Computer Shack

ROBOTTACK

Editor:

The reviewer who did the review of *Robottack* (Bob Safir, July 1983, Page 233) seemed to misunderstand some things about the game. First of all, *Robottack* is not a clone of *Berserk*, but an excellent clone of the arcade game *Robottron*. Second, it is necessary to clear the screen of guardian robots to end the frame. This is not determined by point levels, as Bob says.

I think we shouldn't blame Bob for these mistakes because he is an adult and kids generally understand these things better than adults.

Daniel Fass (age 13)
Marlboro, NJ

MATH ADVENTURE

Editor:

I would like to thank you for publishing the review on *Math Adventure* (October issue). I would like you and your readers to know that the changes specified plus some others have been made.

Thanks for a great magazine.

Dan Tappe
The Software Factory

COCO MAIL

Editor:

While we realize that all software presented for review may receive a poor or bad review we would like to comment on Mr. Esser's review of our *CoCo Mail* program. (October 1983, Page 267).

Mr. Esser pointed out several things about the program that I will try to explain in some sort of order.

He referred to the incorrect use of the terms "file" and "record" in the manual. This was intentionally done in an effort to make the manual as easy as possible to understand by a person that has no experience in the operation of a computer. It was tested on a number of people before being finalized and seemed to be generally well liked. These same people with a little general instruction in how to turn on the computer were able to run the program with little problem. Perhaps we attempted to make the manual "too" simple.

Mr. Esser's next negative remark was about the update file menu. The original version 1.0 that was reviewed accessed the disk quite often. All registered users of the program and *all* retailers have version 1.1 that corrected the update section mentioned by Mr. Esser. This upgrade and all other version enhancements of *CoCo Mail* are supplied to users at no cost.

Mr. Esser leads the reader to believe that 15/16 x 3 inch labels are the only labels this program will print. The program as written will print any standard size single carriage 15/16 inch label up to 3 inch in length. It handles only 3 inch wide labels in the double wide mode. This was done for one reason. *CoCo Mail* was developed with a specific purpose in mind. It was designed for an intermediate or novice user with one disk and a 16K memory. It was also designed to maintain a small mail list where some data entry about each name may be used. In our experience most companies sell double wide labels in minimum quantities of 10,000 while single carriage sizes are available in as few as 1,000. Many actual users of the program are using the single carriage label for just that reason.

Mr. Esser did point out that the create transfer file offers no option. We did not print it in the manual (an oversight) but the user can retain the original "master" disk by running the process file option on the disk after moving the desired files. Options will be added on version 1.2 out in the first half of October.

Mr. Esser complains that there is no option for using more than single drive systems. After all this is a one disk mail list system. He then complains that the disk allocation would allow for a whole seven more records! We like even numbers.

He then made the comment that the screen handling was very "elementary." This is very true, however, to scroll a menu off screen does require the user to repeatedly input alpha characters at the menu prompts rather than numbers. Version 1.2 will use string input but we feel that a person of well below average intelligence is capable of distinguishing between a number and a letter.

The next complaint again details the failure of the update section returning to the main menu. This is no longer in the program and our version 1.2 will also add the scroll feature.

Feedback from our users suggests to us that many of Mr. Esser's impressions about our manual and the usefulness of the program are just plain incorrect. Mr. Esser concluded that the program "certainly will not meet the needs of a business which has more than 200 customers without a lot of effort on the part of the user." We again will point out that *CoCo Mail* was not designed to handle a large general mail list but rather to track a specific number of clients in a very specific way and be able to create secondary files based upon that data file. We also have users that are maintaining files over 1,000 names that are very pleased with the programs performance.

He continues his complaints by claiming that up to 30 grans of the disk are not used. The truth is that during a worst case file transfer the disk is nearly completely filled. In this instance part of the disk is still unused, but what about a damaged or used disk? I'd rather make the program reliable.

Our last objection comes to his reference of program price. Being a CoCo user I must admit that $59.95 is a lot for a mail list program, but I have spend much more for programs that have laid on the shelf unused after a few attempts. The point is that however flawed it may be, *CoCo Mail* works and works quite well. It performs a mail list task of which we have not seen other programs able to do that are comparably priced.

Thank you.

Robert W. Butler
Reitz Electronics, Inc.

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DRAW-IT Doesn't Quite 'Make It'

One of my favorite applications for my CoCo is "computer art," that's part of the reason I bought it two years ago rather than anything else available at the time. I have always been interested in art and am a chronic "doodler." So, as you might guess, when *the Rainbow* sent me a "drawing" program to review, I was more than a little interested.

DRAW-IT, unfortunately, just is not quite up to snuff. It isn't totally without possibilities, however, so I'll give a quick run-down of what the program does and then point out what I think could be done to improve it.

The purpose of *DRAW-IT* is, of course, to draw pictures on the TV screen. In this case, only in *PMODE4* Pages 1—4. This is done by drawing and erasing lines, circles and boxes. There is also one handy command that I found useful, which my "other" draw program doesn't have, and that is VECTOR. This allows you to draw *from* a given point in any direction definable in even degrees 0—360 *for* a specified length. You may then paint any enclosed area you want. When your picture is finished you may save it to tape.

Now for the bad news. Starting from the top, the documentation is just barely adequate, consisting of one side of 8 x 11 paper listing the function definitions and a *brief* outline of the procedures to be used. A word to any users . . . *follow these procedures!* As for the program itself, since it is in BASIC almost all of the "deficiencies" (my opinion) could be easily corrected by an intermediate level programmer. The first complaint I have is relatively minor: there is no way, in the program, to bypass the explanation pages and go straight to the graphics once you are familiar with the commands. There is a note in the "documentation" that you can type *GOTO 100* rather than *RUN*, but one or two more program lines could have done this with an *INKEY$*. I got used to the way you have to set a start and end point for most functions. And I liked the option of changing the jump values for the arrow keys (1, 5, 10 or 20 pixels per key-press). There were, however, two commands which didn't work exactly right: BOX and VECTOR. For some reason there is a line in the BOX subroutine that *erases* a diagonal line when you *DRAW* a box. This is easily deleted. The formulas used by the VECTOR command are just a little off. I'm not sure if it's computer rounding errors or if the formula needs to be refined, but to get straight lines at the eight compass points for instance, four of them have to be adjusted from their true values (45=44, 180=181, 225=226 and 270=271). The other easily changed function is the tape save. As written, the program will operate with the disk controller plugged in, but will not *CSAVE* properly. A method for doing the type of graphic dump used by the author, with the disk plugged in, was published over a year and a half ago by *Chromasette* (CSAVE "filename," PEEK(188)*256, PEEK(188)*256+6143 ,380). And with the addition of an *IF/THEN/ ELSE* the program could have the option to *CSAVE* to tape or *SAVE* to disk. This is especially nice with a "screen print" program, have everything on one disk and print out anything you have *SAVED*.

The program has a decidedly incomplete and rushed look and I cannot really recommend it at this time. But, if JPS were to improve the documentation a little and make a few adjustments (and maybe even a couple of enhancements) to the program then it would be a nice little utility.

(JPS, 11462 Columbus Ave., Fostonia, OH 44830, $15.95 tape)

—Bruce E. Sterling

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Gomoku/Renju A Pair Of Oriental 'Brain' Games

Gomoku and *Renju* are two closely related games which are contained in a ROM Pak from Radio Shack. Because of the oriental name for the game, I was surprised to find that I had played *Gomoku* as a child. You probably have also. I also found out that I had played *at* the game rather than played the game. The characteristic of oriental culture which we Americans have trouble understanding is its seemingly contradictory nature. Simplicity often may hide complexity.

The object of *Gomoku* is to be the first player to place five counters in a row, either horizontally, vertically or diagonally. You and the computer alternate turns in placement. The computer shows this game as blue and yellow pieces on a green and red grid. Blue moves first and the game starts with you as the first (blue) player. You may change this to allow the computer to move first. Moves may be made by either the arrow keys or the joystick. Using the joystick takes a while to get used to but does work. The keyboard is better.

Options which are available in this game include eight levels of play and change of board size to sizes from 9x9 to 15x15. Also the computer can play by itself, and may display the moves it is thinking about. It can give a hint, select book openings, take back moves, and step through the past game. It also is possible to have human players play both sides with the computer used only as judge and playing board.

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When I was a kid playing this game, the other kids and the adults who played it with me assumed this game was simple because it looked simple. I never lost a series of games as a child because I knew a few tricks in the "simple" game. At the highest levels, however, the computer is slow but almost unbeatable. After the large number of flashing arcade games which are tests of reflexes, this game is interesting as a test of brain power. In a way it hurts much more being beaten by the computer when you have all the time needed to find the best moves. The rule book tells me that *Gomoku* is a forced win for the first player. By that it means that if a perfect series of correct moves are made by the starting player, he will win. Above level five I cannot win. At the lowest level I won about 80 percent of the time, and at level 3 (the start up default level), I won about 50 percent of the time. I played mostly at levels one, three, and six. The other levels appear to be in about the expected ratio. My wife wins almost the same number of times as I do, and my nine-year-old beats the computer at level one about 40 percent of the time and at level three about 10 percent of the time.

The other game in the pack is called *Renju*. This game is really the same game as *Gomoku* but it is intended to give the first player a handicap. The first player is given major restrictions on the types of moves which can be made and on the openings which may be used. No such restrictions are given to the second player (yellow). In light of the large number of options which are available in *Gomoku*, there does not seem to be a need for this variation.

There are several things I noticed while playing the game which cannot really be considered as bugs. At the lowest levels the computer plays irrationally. It will make several very good moves and then miss something very obvious. While using the display mode to have the computer show what it is thinking, the moves are made so rapidly, especially at the highest levels, that they cannot be seen. The manual to this game is mostly well written, but the description of *Renju* rules is rather unclear. I am not sure that I understand all of the rules of this variation.

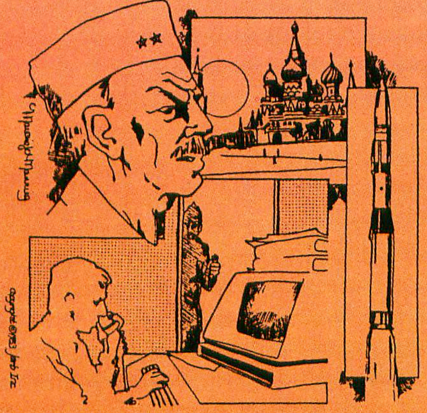
The hints given in the hint mode are rather strange. It appears that the hints are given at several levels lower than the computer is thinking about for its own moves. If you follow the computer's advice, you will almost have to lose. One example of this might be given (one which also, in a small way, illustrates tactics). If one player has three markers in a row with no opposite colored marker at either end, the other player is forced to make a move at one end to avoid losing. (If you have four in a row unopposed, you have a forced win by placing a counter on either end). When the computer has three in a row, it will not often give the hint to cover one of the ends to prevent a computer win. Does the CoCo want to win?

The only other pure thought game that I have played against the computer is the Radio Shack Chess ROM Pak. That game is easily beaten; *Gomoku* is not. I don't believe that the computer can be beaten at the higher levels of *Gomoku* without a great deal of study. If you are interested in having your *brain* beaten by the CoCo instead of your *trigger finger*, try *Gomoku/Renju* for a real challenge.

(Radio Shack, Catalog #26-3069, $19.95, ROM PAK)

—Tom Roginski, Ph.D.

*TALKING PROGRAMS



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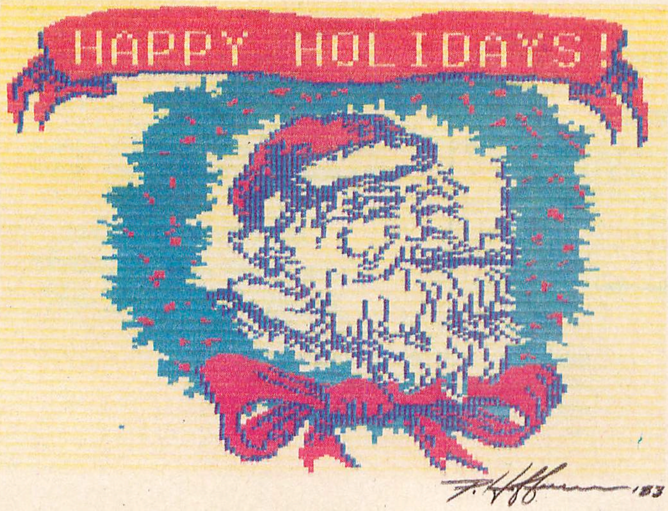
Transtar-315 Color Printer: Richness Of Color And Quality

By Paul S. Hoffman

What has always pleased me the most about the Color Computer is the color graphics. What's always frustrated me the most is the lack of a reasonably priced full-color printer to use for screen dumps. Now there are actually a couple of choices — nothing as cheap as the Gemini or the DMP-100, but what do you expect for full-color?

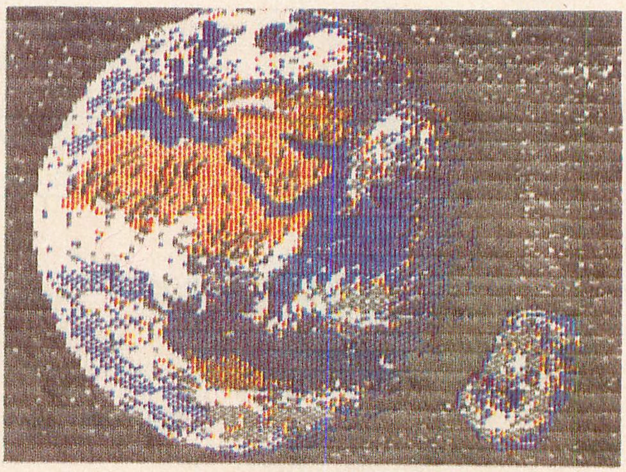
Radio Shack now has available an ink-jet color graphics printer, the CGP-220, for $699. I haven't had much of a chance to play with it, so this isn't really a review of the Radio Shack product. I did, however, check the manual thoroughly, and although a screen dump program is mentioned, it is not supplied with the machine, and no one seems to know when it will be available.

The other offering in the reasonably-priced color printer sweepstakes is the Transtar-315 Color Printer for $599. It is a dot-matrix printer manufactured by Seikosha, using technology quite similar to that in the Radio Shack DMP-100 (I have a Line Printer VII, the older brother of the DMP-100, and I know for a fact that it's a Seiko, too). Instead of one hammer, however, there are four hammers, one for each color. The four-color ribbon (yellow, magenta, cyan and black) passes the hammers at an angle, so that each hammer can access a separate color without the ribbon being shifted up or down. The ribbon is in a replaceable cartridge ($14.95), but Transtar also sells ink cartridges (the ribbon re-inks itself as it moves — four ink cartridges, one for each color, do the job). So, if you want to renew the ink supply before the ribbon itself wears out, it will only cost you $7.95 for a set of ink cartridges. I do think it would be nice of them to provide black ink cartridges separately, since the black is likely to go first — but at this time, they only offer all four colors in one package. To date, I've done around 100 pages of text (black), about 65 full-color screen dumps of various sorts, and around 15 double-size screen dumps, and the cartridge is having a hard time re-inking the ribbon. I've found that doing a color dump that doesn't use black helps to temporarily improve the inking of the black ribbon, but otherwise, a long document gets very gray toward the end. And by now, a screen dump with black as a major color is definitely out!


HAPPY HOLIDAYS!

Now, what can you do with this full-color printer? Well, it will print in typical 80-column format or an extended double-width type; but it will also do compressed type (106 characters per line) and do that typeface in double width, too. Of course, it has dot-addressable graphics capability, even to the extent of specifying the color of each individual dot! One mode available is the "color-scan" mode, in which the user program passes to the printer a separate code for each pixel on the screen, letting the printer organize the information into *single-pass* multiple-hammer runs. In fact, if the user program sends the printer *all* the yellow data for a row, then all the magenta data, all the cyan data, followed at last by all the black data, the printer will wait until every byte has been sent (in a double-width printout of a 256-pixel wide picture, that's 2K bytes of information!) and then assemble that data into a single pass, each hammer striking when needed.

It is possible to send the information for a screen dump to the printer using a simple BASIC program, but the printing takes over half an hour! Most of this is due to the slowness of working through the BASIC interpreter to determine the correct values to send, and then sending them one at a time.



The machine language dump available from Transtar (if you let them know you have a CoCo or TDP-100) will dump pictures in five different modes: *PMODE1, PMODE3, PMODE4*, Alpha-semigraphics 12 or Alpha-semigraphics 24. In *PMODE4*, it even imitates the artifacted blue and red colors. Red and blue can be switched if they come out contrary to your expectations. It is also possible to dump a *PMODE4* screen just in black and white, and make lines come out either black on white or white on black. A regular size dump (2⅜" by 3⅛" takes 3½ minutes while a double-size dump (4⅞" by 6⅜") takes 8¾ minutes.

The standard configuration of the Transtar-315 is with only a parallel interface. To run it with a Color Computer, you will need a serial-to-parallel converter or purchase from Transtar an optional serial port for $119.95. Quite frankly, I find my Botek interface quite adequate at a substantially lower price.

A frustrating side note: I bought my serial-to-parallel interface for use with the LP-VII, and adapted it to draw power from the printer. Now I was confronted with a printer that did not supply the +5 volts needed for the interface! Adapting time again!

Others who have dealt with trying to operate non-Radio Shack printers with the CoCo have discovered the problems created by CoCo expecting a printer to do its own line feed after a carriage return code. The Transtar-315 usually expects a distinct code for a combined linefeed/carriage return ($0A), while the computer's standard "end of line" character is $0D. The T-315 just returns the carriage to the beginning of the line when it encounters $0D. Fortunately, there is a DIP-switch setting which corrects this problem so that the printer *will* advance a line with the $0D carriage-return code.

Some good points: I'm amazed at how *quiet* this printer is! The noise-suppression capability of the cover is phenomenal, considering how noisy its cousin, the LP-VII is. The paper-feeding mechanism is a combination of tractor and pin-feed, so you can use standard fan-fold paper but also feed single sheets. Although printing is not bi-directional and reverse movement (backing up a line) is also not an option, at least you can turn the carriage backwards to move higher on the page. My letterhead involves overlaying two separate screen dumps, and this is very easy by backing the paper up. Controls on the top of the printer include "STOP," "LINE FEED," and "FORM FEED." There is a power-on light and a paper-empty light (also a "copy" light which functions only with special Apple-oriented screen-dump hardware).

Some annoyances: The manual gives no guidance in reference to lining up the paper in the machine. Looking at a four-hammer head with a diagonal ribbon gives you little clue as to exactly *where* the printer will start printing. The ribbon cartridge takes up three whole inches on the left side of the carriage, so 9½" fan-fold paper is definitely *not* centered in the machine. You have to get things lined up by trial and error. On my unit, the tractors seem to slip ever-so-slightly, so that after a number of pages the pin holes on the paper start tearing. One multi-page printout of an assembly listing got hung up in the machine; it sent an error code which *EDTASM+* didn't recognize, and I lost a good segment of the assembly into the tether. The printed labels for the lights and switches, as well as the printed nameplate, are either of too thin a plastic or have too weak an adhesive — at any rate, they're blistering. It's rather sloppy looking.

In summary, I think it's an okay machine for the price. I'm *very* pleased with the richness of the colors and the density of the dot-pattern in both graphics and alphanumerics. I hope I will be able to keep obtaining re-inking sets and/or ribbons. At this point I have no idea what problems I'll run into if it needs servicing. You might have difficulty finding a dealer who handles the T-315. A quick note or call to Transtar will give you at least who the closest wholesale distributor is, and you can have your local computer dealer special-order for you.

(Transtar, Box C-96975, Bellevue, WA 98009, (206) 454-9250, $599)

SAV-A-BYTE
A CoCo Life-Support System

I was sitting at the desk, tapping away at my CoCo keyboard. Another article for *Rainbow* was due. Ah, the wonders of modern word processing: Move a paragraph here, delete a typo there and now for the automatic spelling correction . . . Crackle, zap! Blam! Oh no! That little rain shower outside has just escalated into a thunder bumper. Quick! Save everything to the backup disk! Zap! Flicker . . . Nuts, too late.

Summer thunderstorms are fairly common in northern Kentucky. I suspect that your part of the country gets its fair share, too. I remember one week this summer when the lights went out at least seven times. My CoCo was getting amnesia faster than kinfolk who owe money.

Ed Bordeaux of South Carolina gets his fair share of power outages, too. Most folks just talk about the weather. Mr. Bordeaux is one of the few to actually *do something* about the weather. He invented the "SAV-A-BYTE" battery back-up system for the TRS-80 Color Computer. Thanks Ed.

SAV-A-BYTE looks kind of like a game cartridge with a chunky little battery hanging off it about the size of a couple of paperback books stacked together. The gadget doesn't really use up your expansion slot—an extension plug for your disk drives or game cartridges is provided.

SAV-A-BYTE is easy to use. Your kids shouldn't have to explain it to you more than once. Just remember to plug it in like a game cartridge, turn the computer on and turn the SAV-A-BYTE on. (It's got a little rocker switch on the side.) A little red light shows that the gadget is working and that the battery is charging.

Bordeaux recommends that you leave the CoCo and the SAV-A-BYTE turned on all the time. He says that "constant ON will not harm your CoCo . . ."

When the battery is fully charged, it is supposed to keep a CoCo alive for three hours. The screen display will not work but CoCo has no amnesia! If you expect a prolonged power outage, you can even save memory to cassette tape—provided that your tape recorder has batteries that work.

By the way, if you do decide to turn off your CoCo, remember to turn off the SAV-A-BYTE too. Otherwise, the gadget will valiantly try to keep your CoCo awake even though you meant it to sleep! I loaded in *Zaxxon* one evening, played for a while and then turned off the computer. I came back a few minutes later to work on something else. When I turned on CoCo, there was my spaceship, diligently zapping the enemy in demonstration mode!

I write articles and I write programs. I enjoy these creative activities immensely; but an artist *hates* to have his or her paintings dragged through the mud. I hate to have two hours of work *erased* by a fluke of nature. Thanks again, Ed.

(SAV-A-BYTE, 2857 Emanuel Church Road W., Columbia, SC 29169, $99)

—Dr. Laurence D. Preble

Scott Adams' *Adventures* Finally Come To CoCo

It was a million years ago; it was just yesterday . . .

It seems like it was an eon in the past that I bought my first computer magazine, a 400-page book called *Byte*. I was attracted by a burning interest in computers in general and the cover artwork — a pirate crawling through the window, the Starship Enterprise hovering in the sky, a snake under the bed . . .

And one little word in the middle of the page near the bottom. That word was "Adventure!"

Perhaps this recollection into the past will give you some idea why *the Rainbow* seems to have a soft spot in its heart for Adventure games. We have our Adventure Contest, our special Adventure issue. Maybe, just maybe, that all is because our first close encounter with a computer-kind was through the ages of an Adventure game.

I remember spending days and days devouring *Byte* and, at the same time, discovering a real-to-life Adventure game hidden in the bowels of a local DEC PDP-10 mainframe. It was the famous "Adventure" Adventure in the well-known (and much-explored) Colossal Cave. I spent hours trying to get past the blasted snake.

The date on the cover of that issue of *Byte* was December, 1980.

It contained several well-done articles on Adventure games. One by my friend Bob Liddil, a listing for an Adventure game program by a fellow named Scott Adams and, probably most significant of all, an advertisement on Page 121 for something called a TRS-80 Color Computer.

(Are you all following this?)

Well, Scott Adams' article contained this phrase, which the editors of *Byte* seemed to think was important enough to highlight, that seemed to sum things up for me. Adams wrote about the original Adventure, saying "It seemed unfair that such a fascinating game was restricted to such an expensive machine," meaning, of course, DEC's PDP-10.

In the vernacular of 1980, I said to myself: "Right On." And *then* I noticed the listing for an Adventure Adams had written for the Radio Shack Model I called *Pirate's Adventure.*

What did I know? I went out and bought a TRS-80 Color Computer and sat down to type in *Pirate's Adventure*. When I ran out of my 4K memory, I called Adams' company, Adventure International, to tell them that there must be some problem with the listing in *Byte*. While on the line, I wondered to them when Adams' games would be available for the Color Computer.

Not for some time, if ever, was the reply.

I want you to know that I sat down this week and, for the first time, played *Pirate's Adventure*. Three years later, the dream came true — and in spades. All the Scott Adams Adventures, save the first, *Adventureland*, have just been released for CoCo.

I do not want it to appear that this is the greatest thing to happen since someone found out how to slice bread. After all, we've been fortunate enough to have some really excellent Adventure games available for CoCo. Those from Mark Data Products, Spectral Associates and, recently, Radio Shack itself, come immediately to mind. But the entry into the CoCo field of the Scott Adams Adventure series is a significant event nevertheless.

For the record, the Scott Adams Adventures are called *Pirate's Adventure, Mission Impossible, Strange Odyssey, The Count, Voodoo Castle, Pyramid of Doom, Mystery Fun House, Golden Voyage, Ghost Town and Savage Island I* and *II*.

And this is a review on all of them. Or none of them. It kind of depends on how you look at it.

These Adventures are all text Adventures — what the Adams people call "Compu-Novels." For the most part they are complicated to play, provide some real head-scratching and are laced with some Adams-produced humor to lighten the task of looking for treasure (or escaping the Count) in the dark of night.

Roger Schrag, who has contributed a number of fine utilities to *the Rainbow*, is the author who converted all the Adams programs for CoCo. All are in machine language, and, as such, are fast and very enjoyable to play.

The text screen is divided in half, with the upper part designated to show your location and whatever it is you see. The bottom of the screen is yours — and also gives you the responses CoCo provides to help you through your Adventure. The action is smooth, easy and, well, to use an overworked word, *friendly*. Yes, the Scott Adams Adventures are *enjoyable*.

In the time they have been with us, I have not had an opportunity to delve into all of them. And I have not, honestly, had the time to work even one of them all the way through. But I have had a goodly number of hours in front of the keyboard with them, and I can hardily and easily recommend them to you as a good buy and a fun time.

You may well ask: Is this just an example of someone trying to cash in on the CoCo market with some old Model I games? The answer is a resounding no! These Adventures are among the top in my hit parade, based on sheer playability and uniqueness. Indeed, they are classics in the true sense of the word and as anyone who has read or been captivated by the classics of literature, poetry or art knows, such works belong in a special category of their own.

The Scott Adams Adventures are the Mona Lisa of the computer art form. You will think, ponder, chuckle and have a dandy time with them. I commend them to you.

(Adventure International, P.O. Box 3435, Longwood, FL 32750, tape $24.95)

—Lawrence C. Falk

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DSKLDR - Moves Addresses To Load From Disk

A number of machine language programs, both games and utilities, were written either before the disk interface appeared on the scene or on systems without the disk interface installed. Such a system might be a 16K CoCo. In order to provide enough memory in which to load the program, it had to be loaded starting in the area of memory reserved for the disk interface to store information and thus the problem. These programs had to be loaded and run with the disk interface out or they would not run properly. *DSKLDR* is a program written to read these programs and write them to disk in such a way that they can be loaded from the disk in the usual manner and executed.

The *DSKLDR* is supplied on tape and comes with two pages of documentation. The program itself is relatively simple to operate and does not require a great deal of documentation. It is actually self-explanatory. The prompts are supplied in sufficient detail so that the user knows exactly what is being asked for. The program is written in BASIC and can be loaded from tape and saved to disk in the normal manner. Thus there are no backup problems.

Running the program brings up the main menu, which asks if you would like instructions. Actually they are not entirely running instructions. Included is a brief description of how the program operates and what it is looking for. Thus, if for some reason you forget how to answer the prompts, all you need do is run the program and ask for the instructions. After the instructions section, the user is presented with the second menu. This menu will ask for the name of the tape file to load. Once the name is supplied, the user is instructed to load the tape and press [ENTER]. The screen is cleared and the message "LOADING TAPE" is centered on the screen. Once the program has been loaded, the screen clears and the following menu takes its place.

```
FILE NAME  :
NORMAL LOAD ADDRESS
START                END
EXEC
RESTORE INTERRUPTS (Y/N)  ?
NEW DISK FILE NAME  :
```

Once these prompts have been answered, the screen again clears and the centered message "SAVING TO DISK" appears. When the save is complete, *DSKLDR* asks if you would like to save the program again. If the response is yes, you are requested for the new disk file name. If the response is no, then you are asked if you have another program to save. If the response here is yes, you are returned to the beginning of the program immediately after the instruction section. If the response is no, then the program is exited and you are returned to BASIC Interpreter.

The *DSKLDR* program reads the program to be fixed from tape into a block of memory reserved above itself. Once the program has been read in, a module is attached to the back of it and the execute address changed to the entry point of the added module. That entire block of memory is then saved to disk. When the program is loaded from disk, the attached module is also loaded and executed. The program is then copied from its high memory location to its original memory location. It will now run as if the disk interface were not attached. The disk structures are destroyed, but in the case of most games and machine language programs, a cold start is required and the structure will be restored. Thus no real damage will be done. *DSKLDR* will only run on 32K machines and will only handle programs with lengths of 16K or less. Thus there will be some programs that it will not be able to move from tape to disk.

DSKLDR is a BASIC program that runs as advertised. It will load most 16K machine language programs from tape to disk. *DSKLDR* is designed to move those programs which interfere with the disk interface to disk in such a manner that they can be loaded from disk and run with the disk interface installed. I used *DSKLDR* to move two of the programs which I have on tape and which will not load from tape and execute properly with the disk interface installed. In both cases, the disk version created by *DSKLDR* ran perfectly. Although *DSKLDR* does not require the user to know the load, end and execute address, it does have the limitation of handling only 16K programs and requires a 32K computer. The program is well written, and walks the user through the necessary steps. It has an instructional section built-in, thus eliminating the need to find the instruction if one does not remember exactly how to run the program. The price is such that I would think it should be in the library of every serious games player who owns a disk drive.

(Stuart Hawkinson, 6695 S.W. 203rd Court, Aloha, OR 97007, $13.95 postage paid)

—Frank J. Esser

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BEWARE

BEWARE of products that are housed in cheap plastic. Ours are encased in a sturdy metal case to eliminate TV interference.

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- The tempo can be varied during compositions.
- Music may be saved and loaded and may even be called from your own BASIC program.
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Music compiled using the **COMPOSER** may be played independent of all other software. The **COMPOSER** is menu driven making it extremely easy to use. Nearly 20 minutes of music is provided.

For reviews see June '83 *Rainbow*, p. 192 and May '83 *Color Computer News*, p. 74.

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The **STEREO COMPOSER** is a hardware music synthesizer that plugs into the cartridge slot of the CoCo. The **STEREO COMPOSER** contains two 8 bit digital to analog converters and two separate audio power amplifiers with separate volume controls to drive external speakers directly or your own home stereo system. The advantage of being able to use external speakers rather than the TV's built-in speaker is obvious. Using high quality D/A converters and two channels further increases music realism.

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Demonstration Tape (Stereo Audio Cassette)	$4.00

THE VOICE

The **VOICE** is a hardware speech synthesizer that plugs into the Color Computer's cartridge slot. It uses the sophisticated SC-01 by VOTRAX to reproduce any word in English as well as other languages.

The **VOICE** has two outputs. Speech may be heard through the TV speaker or the built-in audio power amplifier with volume control may be connected to your own external speaker.

The **VOICE** comes assembled, tested, burned in, with all the necessary hardware and software, and a 90-day warranty. Runs in 16K, 32K, or 64K machines.

BINGO The VOICE announces the BINGO tiles while you play the game.

MATH TUTOR The VOICE tutors your child in learning arithmetic.

HIGH LOW The VOICE gives you hints in guessing a number it has picked.

EDITOR This utility program will help you develop words phonetically.

THE VOICE (Hardware and programs above, Cassette or Disk)	$79.95
THE VOICE (40 page manual for evaluation)	$ 4.00

THE TRANSLATOR

The translator is a machine language program that uses a sophisticated algorithm and exception table to automatically convert text to speech. For example, A$ = "THIS IS ALMOST TOO EASY" followed by calling a USR will allow the VOICE to speak. The translator will even allow you to type words in one language (i.e. French) and have the VOICE speak in another (i.e. German).

REACTION Test your reflexes as the VOICE gives you commands.

SIMON Test your memory for numbers spoken by the VOICE.

THE TRANSLATOR (With programs above, Cassette or Disk)	$29.95

ESTHER

ESTHER is ELIZA plus. ESTHER illustrates the high level of artificial intelligence that computers have achieved. Perhaps you have heard of ELIZA that was developed at MIT in which the computer plays psychologist. In our version, the VOICE speaks just as the doctor would. And because it is completely machine language, responses are immediate. You'll be amazed!

* **ESTHER** (32K Cassette or Disk)	$24.95

EDUCATION PACK 1

This package of 3 programs is intended for the pre-schooler.

ALPHABET The VOICE speaks the A, B, C's as they are displayed enlarged.

NUMBERS Enlarged numbers are displayed while the VOICE speaks them.

COLORS The VOICE teaches your child the basic colors.

* Educational Pack 1 (16K or 32K Cassette or Disk)	$24.95

EDUCATION PACK 2

This package of 3 programs is intended for the elementary school child.

HANGMAN The VOICE adds a new dimension to this favorite spelling game.

SPELLING Test your spelling ability with the VOICE.

CALENDAR Test your knowledge of the days of the week, months, etc.

* Educational Pack 2 (16K or 32K Cassette or Disk)	$24.95

EDUCATION PACK 3

This package of 3 programs is intended for grades 5 through 8.

STATES The VOICE tests your spelling ability of the states.

CAPITALS So you think you know the capitals, let the VOICE see.

PRESIDENTS Even adults will find this one challenging.

* Educational Pack 3 (32K Cassette or Disk)	$24.95

* Requires the Translator.

TERMTALK

TERMTALK is an intelligent talking terminal program. Features such as uploading and down loading files from tape or disk are available with many other features which are selected from a menu so it is easy to use. If you have the VOICE, what you see on the screen will also be spoken just like in the movie **WAR GAMES**. If you don't have the **VOICE**, you can still purchase **TERMTALK** and have the best intelligent terminal program available. TERMTALK also comes in a DUMB version that only talks and does not support intelligent features.

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Bio-Detector — Not Too Probing

There are a lot of games you can buy for your CoCo for $35. Most of them come on a cassette, a disk, or a cartridge, and are played with a standard controller, such as a joystick. *Bio-Detector* is unique. Along with the cassette that contains the game software, you also get a cute little gadget that allegedly measures your "bio feedback."

"What is bio feedback?" asks the instruction sheet. To which it answers: "Bio feedback is the amplification of any function of your body. This allows you to be aware of something about yourself that normally you aren't aware of. The *Bio-Detector* measures skin resistance, which is inversely proportional to body stress and is displayed on the screen. This way, you can learn to lower your personal stress level.

At one end of the gadget is a cable that plugs into the left joystick port. At the other end are two probes that wrap around two of your fingers. The little black box, from which these emanate, contains a sensitivity knob.

When you *CLOADM* and *EXEC* the program, you will see a graphic menu on the screen that lets you select the speed of the Scope (fast, medium, or slow), the type of Trace (dots or lines), and two different Audio responses (or no sound).

When you have wrapped the probes around the proper fingers, and pressed ENTER to start the Scope in motion, you must then adjust the sensitivity control until the Trace is at the middle of your screen. In my case, it never moved up from the very bottom, indicating zero reaction. The only way I could get the program to register anything was to touch the two probes together. Somehow, that didn't seem right.

The instructions suggest that you moisturize your fingers with hand lotion. That didn't work for me. So I tried wetting the probes and my fingers with saliva. That made a considerable difference. Now I was able to get a reading without squeezing the two probes together. But the reading that I did get was more in reaction to finger motion than to stress.

My wife says that sometimes I can be very insensitive. So I tried it on her, with the same results, or lack thereof.

The unit plugs into a joystick port, and is read by the computer as a joystick, so it is theorectically possible to write BASIC programs for it by using the *JOYSTK* function. A short sample routine is listed that will sound a tone. "Higher tones mean higher stress," it says.

I keyed it in and tried it. Moving my fingers and turning up the sensitivity control produced lower tones instead!

My recommendation: Save your money.

(Computerware, Box 668, Encinitas, CA 92024, $34.95)

—Neil Edward Parks

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Bumpers — A Maze Game With A New Twist . . .Or Bump

Bumpers is a maze game which involves competition between two players or you and the CoCo. The object *appears* simple enough. One must find a way through a maze before your opponent does. However, the maze is invisible and only by "bumping" into walls do you reveal its intricacies and potential dangers. The first one through the maze wins.

Initial set-up of the maze is under player control. You can determine the height and width of each maze cell, as well as the skill level from 1 to 4. Once selected, the maze is generated quickly and you and your opponent appear at opposite corners of the screen. Each tries to reach the opponent's corner through the invisible maze first. This, in itself, offers a sufficient challenge. However, two additional features have been added which enhance the play of the game. You can "mine" the walls of the maze by touching one and then pressing the button on the joystick. The wall, then, becomes invisible and anyone bumping into it is quickly whisked to another part of the maze. If two players meet on the same portion of the screen, the first one to push the button on the joystick gets to bump the other to another part of the screen.

The game is one of the few on the market in which two players interactively compete against each other in a game of skill and cunningness. If you like maze games and like to compete with an opponent or your CoCo, then this game is for you. Note—CoCo beat me convincingly at skill level four.

I cannot end this review without commenting about Mark Data Products. The tape sent to me by the folks at *Rainbow* would not load in my system. I placed a call to Mark Data Products and informed them of the problems I was having. I received advice on possible remedies and when these failed, I was told a copy would be mailed immediately. Three days later, I received the tape in the mail. The courteous, professional manner in which they handled my problem deserves recognition. As is apparent from the comments in *the Rainbow* and others, CoCo is blessed with many responsible professional venders and one can purchase their products with confidence.

(Mark Data Products, 24001 Alicia Pkwy., No. 207, Mission Viejo, CA 92691, $24.95)

—Bernard Roskoski

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C-TREK
Old Favorite — New Color

About eight years ago, the company I was working for bought their first small computer. This was an old IBM micro which cost about $20,000 and had no color. It was being wasted on such tasks as bookkeeping, payroll, engineering and the like. One day, one of the salesmen for IBM brought a new tape with a great game where I could rid the universe of the Klingons. That's what computers are for! This game has become a classic and has appeared in many versions for all computers. When I first saw the game for review, I thought it was just another version of an old game. *C-TREK*, however, is an improvement of the old classic.

In this game, as in the classic, the Enterprise, the Klingons, your bases, and the stars are represented with text characters (i.e., the Enterprise is an "E"). While this does not use the great graphics possibilities of the Color Computer, it allows this BASIC game to be played with any 16K CoCo. Extended BASIC is not required. The 16K is really packed because of the many features not included in the version I played before.

You start out with a fresh ship and are given your orders to destroy all of the Klingons in the known universe. While your ship is much better than any Klingon ship, or even two or three, you must destroy many more than this (a random number from 13 to 26). You also must carry out your mission in a specified number of moves (stardates) or the nasties take over. Everytime you try to maneuver to your base for resupply or to get a better torpedo shot at your enemy, you use up time. You must learn to use your two weapons (the phaser banks and the torpedos) properly. The phaser is a short range weapon which does damage, depending on the range and shield strength of the ships. The torpedo hits will destroy with one shot, but they must be aimed.

When you enter the sector with the enemy, they get the first shot. After that you trade shots and are allowed to try various sensors, computer data screens, and repair of important ship functions. Each hit on your ship does damage to your shield and will soon decrease the capabilities of each of the ship's weapon and data systems. That is where the real action occurs. You must plan your moves, save energy for shields, plot the course of torpedos, and still plan to be able to get back to your base to refuel. Remember to set shield energy before your first attack or you will get caught with your shields down and die instantly. Your commands to the various ships systems are all three letters. In the command mode you are met with any illegal key-in with a HELP screen, which gives all of the commands and their three letter key. Because the number of commands is limited, I do not understand why the author did not just use one, or at most two letter commands. Because this game is in BASIC and not protected from backup, it is easy to change the command file to something shorter. The original commands under the stress of the game are interesting because as you get caught up in the action, you start making more and more mistakes. I told several cadets at West Point (during a recent war games tournament) that not thinking under stress will kill. I proved my theory by dying while trying to type the proper commands more times than I care to admit.

In this game, I sat with my shield almost down to zero due to battle damage. No problem because I just added more energy to my shields. Then there was a hit on the shield control, <SHE>, and I could not add more energy to the shields. Still, all was not lost because I could go to damage control, <DAM>, and add more energy to the shield control. That was when I found out that the <DAM> Damage Control thing was lost during an early stage of the battle and I couldn't repair anything! If I warped out, the Klingons were allowed another shot at me and I might die. A switch to short range scan <SRS>, and I found that a Klingon moved out of the cover of the star! So I used a torpedo shot at him. Now, is that direction 7.6 or 7.4, or maybe 7.3 would be better or . . . or . . .

The only negative comment I have for the game is the documentation. While the printed version is attractive from a distance, the number of typographical and grammatical errors make it appear rather crude. These mistakes do not cause any problems with understanding the program, but they should have been caught by any proofreader.

This game is beatable. I know it is because over the weekend my friend beat it, although I haven't yet. If you like war games I think you will like this one!

(Spectral Associates, 141 Harvard Ave. Tacoma, WA 98466, $11.95)

—Tom Roginski, Ph.D.

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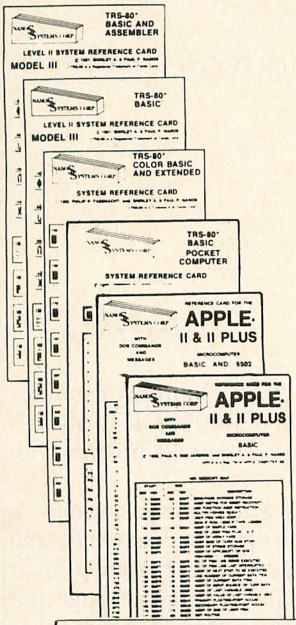
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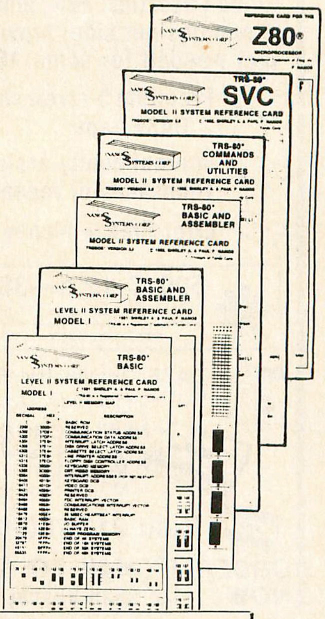
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Pritty Printer: Close, But No Cigar!

(Hum the introduction to the Twilight Zone). Submitted for your approval, a simple little program. One that tries to fulfill the ultimate goal of every hacker. A listing of a BASIC program, with all statements and functions on separate lines, each line indented from the line number. And all bundled up with a heading on each page. It calls itself *Pritty Printer.*

Pritty Printer will take a line like this:

```
20 P1=1:LL=70:PL=66:DS$="Y":DF$="N":SW$="N":
              DA$="":LD$="Y"
```

And digest the jumble of tokens and ASCII to produce the following:

```
20   P1=1:
     LL=70:
     PL=66:
     DS$="Y":
     DF$="N":
     SW$="N":
     DA$="":
     LD$="Y"
```

This output is achieved simply. *Pritty Printer* consumes a BASIC program that has been saved in the ASCII format. It then takes this information and begins to break up lines with multiple statements.

First, it hunts out the colons; when one is located, a carriage return is appended. This process is repeated for the entire program. Next, a check is made on the current printed line. *Pritty Printer* will automatically format each page and skip over the perforations (perfs being the vile things that they are). Each page is headed with the name of the program and date, if you so desire. The output is very clean and attractive.

Alas, *Pritty Printer* is not without flaws. And it is these flaws that cause me to hold back on the praise.

I feel that programs such as this should be in machine code. This way you can have the program you are looking at in memory. No need to re-save a program in ASCII and clutter things up. There are some very good co-resident pretty listers out there. Machine code shouldn't be too much to ask.

My second reservation is on price. I think that a program that digests ASCII (and not that quickly, either) should be in a lower price range. In fact, if you dig around a little, you will find a similar program listed in *the Rainbow!*

In final retrospect, *Pritty Printer* does do a pritty good job. I would rather spend the same money on a machine code program.

(Spectrum Projects, 93-15 86th Drive, Woodhaven, NY 11421, $19.95 plus $3 S/H disk/tape)

—Walter Seay

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Data 500 — A Limited Utility

Data-500 functions as a scratchpad type of information storage system. Files of up to 3000 characters each are created by entering automatically-numbered records consisting of 1 to 249 characters. The program subsequently allows replacement, addition, and deletion of records. Data can be saved to or read in from tape. A printed record of each file is available with the name of the file and the date printed.

A file with two addresses and some supplementary information typically would look like this:

1 John Q. Doe
2 6809 CoCo Street
3 Rainbow City, USA
4
5 Jane Q. Buck
6 80 Epson Blvd
7 Tandynia, USA
8
9 Note: (These addresses are representative of the increasing numbers of persons discovering the capabilities of the RS Color Computer.)

Each number above is a separate record.

The program lives up fairly well to its billing of "user friendly." The documentation (instructions and general information) is well organized and appears complete.

However, the program's versatility is extremely limited. Since each record is entered as a string, data cannot be separated by commas or colons. The program cannot sort or search; once records have been entered, they can be retrieved only by specifying a particular data "line" (which can be up to 249 characters, about 40-50 words) or by reviewing the entire file on the screen fifteen records at a time in the order entered. If the fifteen items exceed screen size, the top lines scroll off the screen and only the bottom fifteen lines appear. The same potential problem exists in the replacement routine.

The print format is limited to a listing of the record numbers and their content. The author warns that choosing the print option on the menu without the printer being on will require a reset of the computer. This could easily be eliminated by having the computer *PEEK* at the printer status and returning to the menu if it is not on.

With a little work, its usefulness could be increased. For example, by entering null records to create the necessary line feeds, (as in No. 4 above), the print routine might then be used as a label writer — *if* you don't mind having numbers in front of each line. Perhaps you might add routines to sort, to strip line numbers off for printing labels or to detect when the printer is off.

If your needs or computer capacity are limited to a simple, easily-usable program for storing lists, recipes, inventories, notes or general information without the need to retrieve or use that information in any order other than the way you put it in, you might find *Database 500* useful if you find it at a bargain basement price.

You might also find this to be a good program for learning about basic information-handling routines. In fact, it is the kind of thing you might expect to find in a collection of introductory or instructional programs. As software standing on its own, however, it is something we might have expected a couple of years before the current level of sophistication was reached.

If you need real information handling on a tape system, and are prepared to spend a few dollars more, you should be taking a look at something like *TIMS* (Tape Information Management System) or *FILMASTR* ($25-$30). If you have or expect to have a disk system, cast an eye not only at *FILMASTR* but also at the other database management utilites now appearing on the market, such as *Homebase, Pro-Color-File, Flexi-Filer* and *Super Color Database* ($65-$80).

(Litefrac Software Inc., 2002 N. Magnolis, Tuscon, AZ 85712, tape $12, 16K)

—Warren S. Napier

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Computer Shack Release Out Standing In Its Field

Outhouse, from Computer Shack, is one of those rare arcade games that you can love. It has a unique personality all its own and is a completely original concept. That, alone is enough to recommend this 32K machine-language diversion in these times of clones and repeats of coin-operated games.

The premise is simple enough. You, (the player) are the guardian of the outhouse. You hover overhead in your sleek flying saucer, which is equipped with a Mark VII Toilet Paper Snatcher Zapper. There is also a Vertical, Horizontal, Diagonal Squatter Stopper. Both these laser-based weapons are designed to teleport to jail (somewhere off screen) two kinds of antagonists in the game, those who take paper and those who occupy the outhouse without permission, each of which garner off points until you can zap them.

There is more. Hostile UFOs try to zap you from the sky. They distract you while the villians do their dastardly deeds. If you hit an outhouse or touch one of the opposition, KABLOOIE! Bye-bye, you.

This cute little game is one answer to that obnoxious question, "But what can the computer DO?" One trip to the *Outhouse* and they won't be asking questions for a while.

There ought to be an award given for eye-pleasing packaging. Any retailer would declare he'd gone to heaven for sure with the Computer Shack visual presentation.

Everything about this game is right. Joystick response is clean and smooth. Internal, (on screen) graphics are crisp, colorful, functional and enhancing to the game. The sound won't drive you into rubber ranch retirement. And despite the hint of wry bathroom humor, there's nothing about *Outhouse* that your three-year-old or Granny could object to.

Outhouse is a winner. Four Stars for originality, playability, visuality and pure genius in total presentation. The only complaint I had was that the darn package didn't have a hole in it so that I could put it on a pegboard hook. If you like arcade games, but are sick of monkeys, ghosties, and things falling on your head, then you might like to sit down and enjoy a copy of *Outhouse.*

(Computer Shack, 1691 Eason, Pontiac, MI 48054, $27.95 tape, $29.95 disk)

—Bob Liddil

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Enter data by just filling in the blanks. This form fill-in is easy and natural to use. You can even copy data from the previous record with one key-stroke. Add records, delete records, change records without fuss.

Tell FILMASTR to sort your file on any field that you want or to retrieve a particular file and the job is done with super-human machine language speed. FILMASTR will find a single file or a group of files that meet your request and will save those records as a separate file if you want to.

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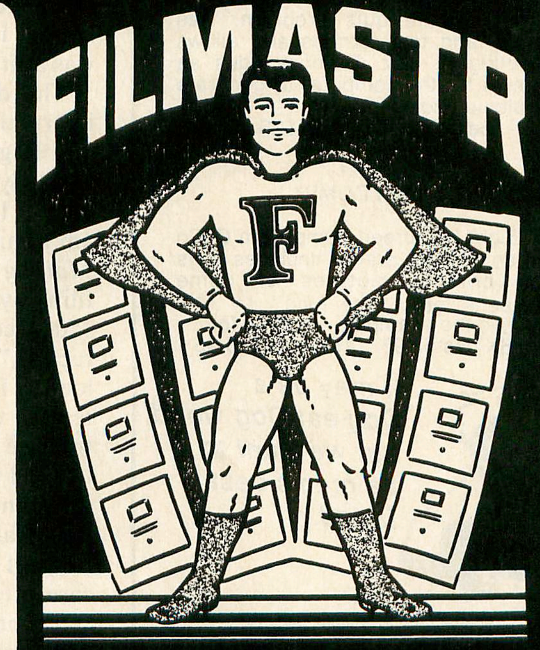

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Mailing List Gets The Job Done

Here's a good, basic, mailing list program that prints labels, envelopes, phone number lists and has exact documentation. That's how I felt after working with Prickly-Pear's *Mailing List* program. But this program also runs a machine language program that sets your screen to high resolution for full upper- and lowercase, in your choice of green or white background, with a 42-character sentence. While the documentation seems to mention the High-Res screen in a casual by-the-way attitude, I feel that Prickly-Pear should have used a banner headline. I really liked the size of the letters and numbers, with both the upper- and lowercase characters. I have had some problems with reading the screen on some other High-Res programs, but the 42-character design chosen for *Mailing List* worked quite well on my Sylvania 13-inch TV. You have a choice of either a "light" or "dark" screen. I preferred the dark screen, as it was a little easier for me to read.

The documentation states that the instructions are "truly user friendly" and I agree, although, just as with any utility, you have to get used to working with it. I have a mailing list service and I am familiar with this type of program. *Mailing List* is a " . . . random access filing system which can handle up to 1500 records with six fields in each record." To be honest, I did not try to load in 1500 files with six fields for each record to verify this statement. This time we will have to take their word for it. I did try out all of the features of the program and found only one problem that was not mentioned in the directions. If you are using upper- and lowercase letters you must use the [SHIFT] to enter commands (ie., The program prints "All correct [Y/N] or [COPY]" and you must press shift Y,N or C). If you are using all capitals (uppercase) there is no problem.

Mailing List is set up for Radio Shack's DMP-200 but I did not have to make any line changes for my Okidata Microline 82. Prickly-Pear lists line numbers for high-speed pokes, label print routines, and ZIP code order change. I would have appreciated the line number for *Print #-2* statements although it is not that difficult to look through the program if your printer does not follow the print routines.

After the lead question, "Are you loading a new file [Y/N]," the program asks you if you want the light or dark screen. It alternates between the two until you decide. You are then given the choice of continuing or aborting the program. If you abort, you can start the program over again with a different screen, or change your answer to the lead question. Following this, the main menu comes up with seven choices: 1) start/add to list (name—30 characters, address—30 characters, city/state—30 characters, ZIP—12 characters, phone—12 characters, code field—5 characters); 2) review/edit list (for reviewing, correcting, or copying to printer for label or envelope. This also has a record search with string, record, ZIP code or individual search); 3) print all records (single or double wide labels); 4) print particular records (search routine); 5) print phone numbers (single line print of name and phone number only); 6) load new file (start a new listing); 7) end program (returns to BASIC but stays in High-Res screen).

There are special instructions for alphabetizing and the documentation does a good job explaining the procedure since you have to use the "alpha" program without the High-Resolution screen. Prickly-Pear explains that a file of over 1000 records will take several hours since the program reads and writes to disk thousands of times (That's how they can have up to 1500 records) and they recommend letting the sort run overnight.

My conclusion of *Mailing List* is that it is a fine program and does what it is supposed to do.

(Prickly-Pear Software, 9234 E. 30th Street, Tucson, AZ 85710, $49.95)

—Michael F. Garozzo

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Federation Boot Camp Quickly Becomes Repetitious

As I sat at my computer terminal one day lamenting how boring life had become in the "age of the federation" I found myself longing for a new challenge. The year was 4931 in the galactic age and there just wasn't much left in the way of new frontiers. Suddenly the screen before me sprung to life, as it often does, to deliver some mundane message. But wait, this is something I haven't seen before . . . drafted!! I had been called for duty in the Galactic Space Federation. Among other things this meant that my first stop was Federation Boot Camp, a grueling 16 week course of instruction in space combat and navigation. This is the scenario for *Federation Boot Camp*, an arcade game program from Carl Shell, written by Bob Schmerling.

There are two versions of this game, a 16K program and a 32K program. The only difference between the two is that the 32K version uses a higher resolution mode. The 16K version is a little more colorful but both are pleasing to the eye.

The game consists of four different tasks on four different screens. Successful completion of the four tasks four times in a row allows you to graduate as a space cadet. Each pass through the four tasks is more difficult than the last. Each task is a relatively unsophisticated mini-game (note I said unsophisticated, not easy) that involves completing an assigned task while using a minimum of fuel.

The first task is called "trajectory" and is essentially a guessing game in which you input ranges to a target, bracketing it until it is hit and destroyed. Task number two, called "star maneuver," is a maze of asteroids that you must successfully navigate through, avoiding collisions and the droid which chases you and attempts to destroy your ship. Successfully docking at the base at a minimum speed without any collisions will move you on to the third task. The third screen is called "mine scanner" and involves moving through a grid without backtracking or crossing your own path while avoiding the mines. A scanner is provided to help determine the positions of the mines; but be careful, your own accuracy affects whether you get to see where *all* the mines are. Task four is called "hyper track." Here you use the joystick to steer a course through space. You must stay between the boundaries of the track in order to increase your speed to a certain required minimum before fuel runs out.

Failing to successfully complete any of the tasks will result in your being kicked out of the federation. However, you are given the choice of whether or not you wish to try again.

Documentation for *Federation Boot Camp* is good; every aspect is explained fully. There is no doubt left as to what is expected of you. Packaging is nice; the cassette comes in an attractive book sized box.

Although initially intrigued with the premise of this game, I soon became aware that this was really just four rather simple games strung together to create a longer game. It becomes repetitious too soon and just doesn't live up to the quality of other arcade-type games that are available for CoCo. The graphics demonstrations between scenes are pretty, but I soon found myself waiting rather impatiently for the next task to begin. All in all, I would have to say that this one will probably stay on the back shelf most of the time.

(S&S Arcade Supplies, 8301 Sarnow Drive, Orlando, FL 32807, tape $18.95)

—David Johnsnon

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Hint . . .

Incremental Advice

Most 6809 machine language programmers are familiar with, and take advantage of the 6809's capability for automatically incrementing by 1 or 2 the base register used in the register offset addressing mode. They know that the incrementation is accomplished after the effective address has been determined. However, some may not realize that the incrementation takes place *prior* to execution of the instruction. That is, for example, if we have the two steps:

```
LDX #$400
STX ,X++
```

many would expect the value $04 to be stored at $400, and $00 at $401. While $04 will be stored at $400, the value $02 will appear at $401, because the value of the X register is incremented twice after the address to which the store will go has been determined ($400), but before the store instruction is executed.

For automatic decrementing, there is no such ambiguity, since the register's contents are incremented prior to the address being determined, and therefore also prior to instruction execution.

—Major Richard D. Benton, USAF
Seattle, WA

Alphabet Is As Easy As A, B, C!

Alphabet from CY-BURNET-ICS is a great game/learning program for preschoolers. It is good to see good quality software being developed for small children and especially for educational purposes. This is a colorful educational tool that is easy to use, and preschoolers can learn as they play.

Alphabet was not designed to be a game in that it does not keep score and does not scold for wrong answers, nor does it actually give any praise for the right answers given. Our five-year-old could already recite her alphabet and could sing it even better, but *Alphabet* reinforced this knowledge and increased her skill of letter recognition and letter placement. The objective of the program as stated by the creators "... is to teach the alphabet through letter recognition in and out of sequence by using a variety of exercises ..."

Alphabet is written for the 16K Color Computer with Extended BASIC. It is a machine language program and comes on a cassette tape with two copies of the program. One program uses the speed-up *POKE* and the other does not, so this can be used on older models. It has an auto-load feature which gives you something to look at while the program is loading. Soon, you are prompted with a menu giving six exercise options. My preschooler, of course, cannot read the menu, but after playing several times became aware of the "number" of the exercise she liked to play.

The six exercises use visuals in the form of graphic letters to teach the alphabet by letter recognition. The first exercise utilizes an audible alphabet (already pre-recorded on the program tape) to coincide with the visual alphabet. Using the recorded voice does require special instructions to your child. While the recorder is in the play mode, the child cannot respond until the computer turns the cassette off. I simply told my preschooler to listen for the click that is heard when the computer turns the cassette recorder on or off. This is a great exercise to teach young children the alphabet. The second exercise is the same as the first without the voice option.

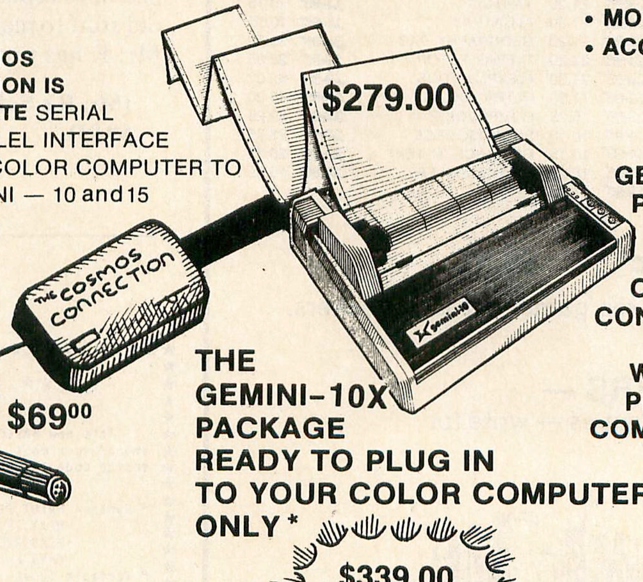
The next three exercises help to reinforce the learning of the alphabet. They use the "next letter" approach by giving the student a letter, either in sequence or at random, and instructs the student to give the next letter. By giving the letters at random, the exercise helps to develop letter recognition speed and letter placement. This is good for older preschoolers or first-graders.

The last exercise is the most advanced in this basic educational tool. The program lets the computer select 22 nonrepeated selections of five letters in sequence, with one letter missing. The student selects the missing letter. As in all the exercises, the program advances only after the appropriate key has been pressed.

This is a fine educational tool for small students. It has all the features one should expect from any advertised software. The documentation is complete with loading instructions, program operation, and ideas for special adaptations. Besides the teaching of the alphabet, it allows small children to use the computer. I would also like to add that this would be a great program for special education students and slow learners of any age.

(CY-BURNET-ICS, 5705 Chesswood Dr., Knoxville, TN 37912, $24.95 on tape)

—James D. Ray



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2Fer One — An Interesting Bargain

Two games for the price of one is implied by the title *2Fer. Gandola* and *Copy-Cat* are the two games included on this 16K Extended BASIC cassette.

Gandola is played by maneuvering a low resolution graphic balloon over a mountain and between two pine trees. A simple procedure which proves to be quite a challenge, when the wind factor kicks up. Gravity continues to attract the navigator to the earth while the iron clouds above the mountain attempt to drive into the easily punctured rubber lining. The balloon's pilot must combat these forces to conduct a safe landing at his destination. Using only keyboard action, the automatic repeat format is unavailable to the aviator. This feature adds adventure to the navigating task while exhausting fingers and keyboard.

The computer takes on human identification when *Copy-Cat* is loaded. "Me" and "You" square off to do battle. Can the computer perform a pattern of flashing squares that "You" cannot follow? The contender attempts to mimic the computer's lead. Only one level of play is provided in *Copy-Cat.* The patterns prove difficult, eliminating the possibility of repetitive competition.

All of the action takes place on the keyboard in both games. In each case, a joystick could have been used to provide better control of the action, and an option for choice of play would have made the games more appealing. However, the keyboard action is amply explained.

These two amusements are favorably presented and the instructions are well-diagrammed.

Gandola's theme could have been elaborated upon to produce a more thrilling game; it is interesting, but readily becomes repetitious. *Copy Cat* is fun to play, but it may be old stuff to many computer challengers. Together, however, Mr. R has provided a rather interesting bargain twosome.

(Mr. R's Software, 68 Kelly Rd., So. Windsor, CT 06074, $9.95)

—Loretta Jessup

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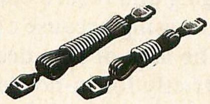

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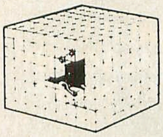

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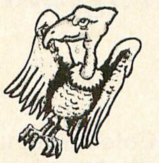

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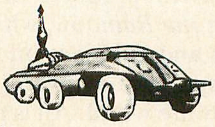

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Reviewer Finds Lowercase Program Of Dubious Value

The Color Computer is the apparent survivor of the pack. And, as such, we are seeing a veritable spate of new products hitting the market to satisfy our thirst for utilities and applications software and even hardware designed to make our CoCo sit up and shine. Luckily, most of the new releases are quality, useful products. Still, despite the services of magazines like *the Rainbow,* which offer reviews to give you our opinions and guidance on the relative worth of those products, especially software, it's still a "caveat emptor" or buyer beware world. All is not really worth what it's cut out to be.

Take for example this software-driven lowercase kit for owners of Radio Shack's Line Printer VII and DMP-100 called *Lowrcase*. Now, we all know that venerable printer doesn't have true descenders, those nice squiggly tails on the g, j, p, q and y characters in lowercase. We also know that the LP VII is painfully slow with its unidirectional, 600 bps, 90 byte buffer scheme. But, when we bought it over a year ago, it was the most we could afford and still keep peace and harmony in the household. Without it, many of us would not enjoy the many benefits a printer affords the hobby computerist.

When I invested in my LP VII (on sale at $299 over a year ago), it was to give me some means of listing programs to paper for debugging and record copy. I envisioned little use of it for word processing because of its relatively poor character set style. The lack of true descenders meant that any printouts were strictly for in-house use. I knew what I had and accepted it. It took me a while to get used to those pseudo-descenders, but I did. No big deal until I needed better quality—for which I simply saved my pennies.

I know, I'll probably be accused of not giving this package a fair shake. So be it. I'll say it right up front, though. I don't think KRT Software's *Lowrcase* for the LP VII and DMP-100 is worth the money or the effort considering the product delivered. They're now marketing a piece of software (actually two programs) which will supposedly let your LP VII or DMP-100 rival the "bigger" dot-matrix printers with true descenders.

The package comes on cassette tape with two programs, *Chrout* (machine language) and *Lowrcase* (in BASIC). The *Chrout* program modifies any machine language program in memory to print using the BASIC character output at Hex A2BF, says the accompanying sheet. This is the one which lets you use your printer and get true descenders under *Lowrcase* with *Telewriter-64* (Cognitec) and other machine language programs. It's designed for Extended 32K and 64K tape or disk machines with version 1.1 BASIC. (Take note that it was not tested with 16K machines.)

The program which actually delivers the lowercase descenders for those five little letters with their tails (g, j, p, q and y) is *Lowrcase*. With it you can pin the tails on under "most" BASIC word processors and any machine language processor using ROM print routines as well as the *PRINT#-2* command directly in the immediate mode.

Enough of that, though. What will you actually get for your money if you decide to turn it loose?

This program uses Extended BASIC's graphics features to draw the tails for reproduction by the dot-addressable printer. That's as basic as I can put it. To do so, the printer must produce 80 columns of print and then on the next line append the descenders. Yes, in order for it to work properly you must in essence double-space your printouts. The software takes care of the double-spacing. If you don't double-space, minding your p's and q's as it were, you won't have a leg to stand on and the descenders are lost completely.

There it is. That's all there is to it! Ain't no more! I didn't even bother to try this with *Telewriter-64* (thereby probably leaving myself open to criticism). At 600 pbs, the LP VII can be painfully slow if you're waiting for it to finish a listing or other printout of any length. Add to that this program's scheme of using the next line to "pin the tails on" and you increase print time by a factor governed by the number of g, j, p. q and y characters in your text.

Is it worth it? Not in my opinion. Save your money. Sorry, fellas. Glad you tried, but this one still won't get the printout past the editor or the test grader.

(KRT Software, P.O. Box 41395, St. Petersburg, FL 33743, tape $15.95)

—Ed Lowe

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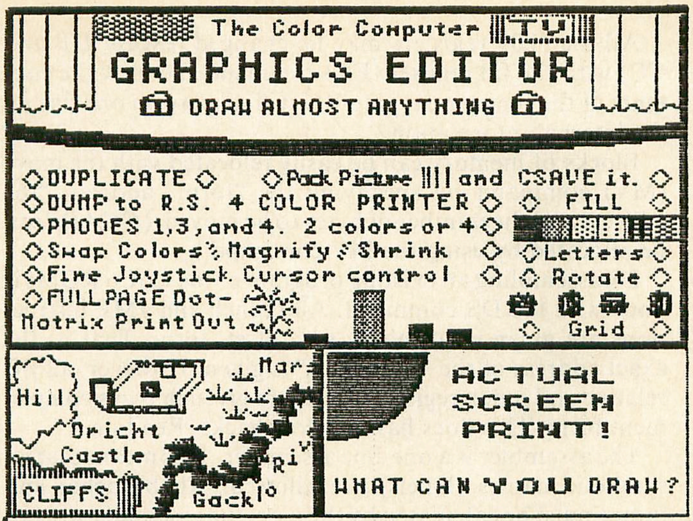

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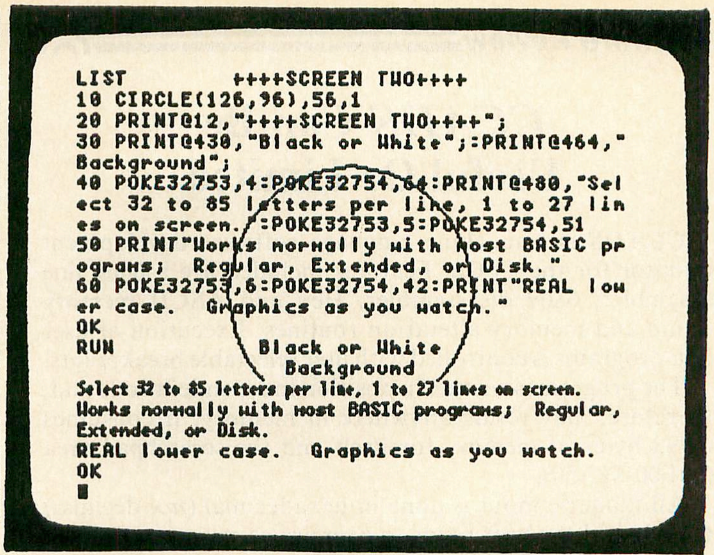

```
LIST          ++++SCREEN TWO++++
10 CIRCLE(126,96),56,1
20 PRINT@12,"++++SCREEN TWO++++";
30 PRINT@430,"Black or White";:PRINT@464,"
Background";
40 POKE32753,4:POKE32754,64:PRINT@480,"Sel
ect 32 to 85 letters per line, 1 to 27 lin
es on screen.":POKE32753,5:POKE32754,51
50 PRINT"Works normally with most BASIC pr
ograms;  Regular, Extended, or Disk."
60 POKE32753,6:POKE32754,42:PRINT"REAL low
er case.  Graphics as you watch."
OK
RUN             Black or White
                  Background
Select 32 to 85 letters per line, 1 to 27 lines on screen.
Works normally with most BASIC programs;  Regular,
Extended, or Disk.
REAL lower case.  Graphics as you watch.
OK
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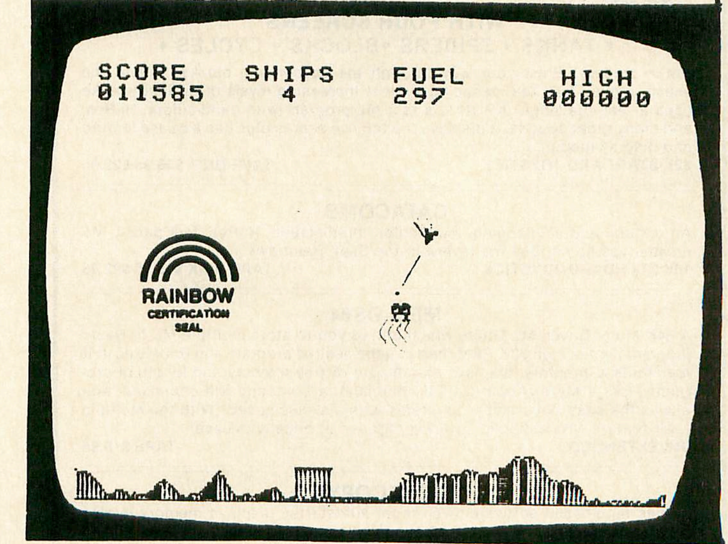

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CCADS Can Be Useful Or Limited

CCADS is a machine language software development monitor for the CoCo. Features included are a 6809 line assembler, 6809 disassembler, Hex and ASCII memory dump and memory alteration routines. Execution of user ML programs is controlled with user selectable breakpoints.

The program is written in position independent code and, therefore, may reside anywhere in memory. It consumes 6,993 bytes of memory for itself and the scratchpad area ($0F00-$2A50).

All numeric input is done in hexadecimal (*not* decimal) format and the user needs to exercise caution so as to not overwrite *CCADS* memory area.

The dump memory (DM) command outputs memory contents between user specified address range, in both Hex and ASCII representation. The output is a neat format of eight memory locations per line, the Hex values followed by the ASCII code. Scrolling is rapid across the screen but may be suspended and restarted by hitting SPACEBAR.

Memory examination is done with the EX command followed by the address to be examined. The output shows the address and its contents, again in Hex form. The contents may be readily changed by typing in the new value desired, then the next address is displayed. To backstep, the minus key is used and examination terminates with the left arrow key.

All the 6809 registers may be changed (except DP and CC) with the fill register (FR) command. To view the contents of the registers, typing RG will display on one line all the internal information.

Blocks of memory can be easily relocated with the move (MV) command by specifying the "form" address, "to" address and the number of bytes to be moved. (*CCADS* can be relocated by using the MV command.)

Disassembling an existing program or the CoCo ROMs is done with the DS command. All branch and JMP instructions are given in absolute, not offset, form. That is, the exact address of the "branch to" is given. However, all PC relative and index register offsets are given in two's complement form. This does have its drawbacks. Read on.

The assembler is a one-line assembler. This means that no symbolic names (labels) are allowed. All branches and jumps must be calculated by the user, the assembler will not compute them. Also, all branches and PC relative instructions must be in absolute, not offset, form. To complicate the matter further, the absolute values must be in two's complement form. This is no problem if the value is positive. But if the value is negative, calculations begin. For example, the instruction STA 2,X in *CCADS* would be STA $0002,X. But the instruction STA -2,X in *CCADS* form must be STA $FFFE,X. If you don't understand the conversion of binary numbers to their two's complement form, then you have a real problem. (The conversion to two's complement form is too big a topic to try to over in this review.) If the disassembler encounters an STA -2,X instruction, it, too, will output the two's complement form of STA $FFFE,X.

Except for the above limitations, the assembler works well. After assembling the program, the user must set a "breakpoint" with the BK command to specify where the program ends. (Five additional breakpoints may be set within the ML program for debugging purposes.) The program is then executed by giving the GO command followed by the starting address. Upon completion of the ML program, all user registers are displayed. To clear breakpoints, type CB.

The output device may be specified as being the screen with the SE command or the printer with the PE command. The printer's Baud rate is easily set with the BA command (BA 2400 would set the Baud rate to 2400).

If your main desire is to write ML programs and you need a strong assembler, then *CCADS* is quite limited, but as an ML examination and debugging system, *CCADS* is useful.

(Chroma-Systems Group, P.O. Box 366, Dayton, Ohio 45420, 16K or 32K, $19.95 on tape, $23.95 on disk)

—Al Burzynski

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Statement Writer A Creditable Program

A succession of generations of college students have labored over the textbooks and ledger sheets as they attempted to master elementary accounting (double entry bookkeeping). It is a difficult concept, but once you've mastered it, you wonder why it took you so long. After reviewing *Statement Writer* and *Disk Double Entry* (several years after receiving a master's degree in business administration), I am now aware of how much easier it could have been —and can be for today's students — to set up accounts, enter transactions, reconcile accounts, generate reports, statements and mailing labels. And all of this can be accomplished without the pile of pencil eraser residue common to freshman accounting. Needless to say, the same features make these two programs very attractive to the small business owner or the small club, organization or league treasurer or the entrepreneur who wants to keep their "books" for them for a fee.

Statement Writer is a utility program that provides enhanced account maintenance, statement generation and mailing for another program marketed by the same vendor, Custom Software Engineering. The main program is *Disk Double Entry (DDE). Statement Writer* works only with *DDE — it is not a stand-alone program.* It was reviewed by Lonnie Falk in the January 1983 *Rainbow*. For those who began subscribing after January, or who otherwise don't have access to that review, I will briefly summarize the features of *DDE.*

DDE requires that you have an understanding of double entry bookkeeping. You don't have to be an accountant, but you must understand what asset and liability, and income and expense accounts are; how to debit and credit accounts, what a trial balance, an income statement and a balance sheet are; and how to close the books. *DDE* is a menu-driven general ledger program that uses error-trapping techniques and is extremely user friendly. It requires 32K with Disk Extended Color BASIC. Armed with these requirements, you can handle approximately 300 accounts and about 1,400 transactions in a single drive system. The actual number of accounts depends upon how many heading accounts (e.g. "cash") and "total" accounts (e.g. "total assets") that you use. These are considered to be accounts by the program but obviously cannot be used in the normal sense of an account. The program allows you to set up accounts, enter transactions and generate reports (transactions, trial balance, balance sheet and income statement). In his review, Lonnie was impressed with the program's ability to handle dates, a unique method of closing the books during the course of an accounting period and was particularly impressed with the ease of entering, commenting and updating transactions. So am I! It is difficult to make a transactional mistake using this program.

You may be wondering why I'm spending time on *Disk Double Entry* if this is a review of *Statement Writer*. Well, without *DDE* there is no need for *Statement Writer*. Making a purchase decision on *Statement Writer* without understanding *DDE* would amount to buying a pig in a poke. At the end of his review in January, Lonnie noted that *DDE* did not include an accounts receivable or an accounts payable module. The folks at Custom Software Engineering were listening and now there is *Statement Writer (SW)*. This enhancement to *DDE* is also menu-driven, uses error-trapping techniques so that mistakes won't creep into your work and is extremely user friendly. The program is supplied on tape with instructions for saving it to disk. It uses only the accounts that have been created by *DDE.* All input of transactional data is still through *DDE. SW* allows you to enter account information (this is usually the name and address for the account) that is used only by *SW,* while still maintaining all of the transactional and comment data entered through *DDE.* The addition of this capability allows for statement generation and billing of customers. It even allows for the generations of mailing labels. An enhanced summary transaction report may also be printed out with *SW* for those accounts visible to *SW* showing both account activity and current status.

You must designate which *DDE* accounts are to be used by *SW*. Only those *DDE* accounts will be visible to *SW*. You begin by selecting "account maintenance" from the *SW* menu. This allows you to add, change or delete the *DDE* accounts that will be used by *SW*. If you add new accounts while using this option, they will be available for both *DDE* and *SW*. You may add up to four lines of information (e.g. name of person, company name, street address, city/state

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address) containing no more than 62 characters each. Statements are generated on an 8½ x 11 page with the account activity at the top (opening balance, transactions, total charges, total payments, closing balance) and the balance due or credit amount at the bottom. You may select a starting date for the transactions that will be included in the statement. Your company name and address are printed at the top of the statement and also at the bottom, where the customer is told to "Please Pay To:." You are instructed on how to insert this data in the *SW* program. This option also allows you to input a message at the top and one at the bottom of each statement (e.g. "January 1984 Invoice" and "We Appreciate Your Business"). The program will not type statements for heading or total accounts or accounts that have zero balances or have had no activity during the statement period. It will, however, print a statement for an account with a credit balance, with the welcome message at the bottom, "No Payment Due." The account summary option allows for the printing of an enhanced account summary for all or selected accounts visible to *SW.* Addresses for the accounts may be included and you may also input a one-line comment to be printed at the top of the summary page. Mailing labels are printed using the same information as requested for the statement option. Labels are only produced for accounts for which statements are produced.

The documentation for *Statement Writer* consists of six, standard size, single-spaced, typed pages stapled together. The documentation does a good job of explaining the operation of the program, provided, as it points out, that you are familiar with *Disk Double Entry.* The program performs as described.

The real power of both *DDE* and *SW* is the ability that has been designed into both programs for user modification. All of the variables are explained in the documentation and examples are given of modifications necessary to achieve a suggested result. While *Statement Writer,* as supplied, amounts to an accounts receivable program, it is possible to modify it to create an accounts payable system — and this is suggested in the documentation. Two full pages of the *SW* documentation are devoted to customer modification of the program.

The price for *Statement Writer* is $34.95. The price for *Disk Double Entry* is $44.95. I would have expected that previous owners of *DDE* would have been given an opportunity to upgrade to the enhanced version of *DDE.* There is at least one major reason for providing separate programs — not all small businesses and clubs and other organizations interested in this kind of program send out bills to customers. If you don't need the enhancement, you don't have to pay for it just to get the capabilities that you do need. However, for $80 a small business owner or a small organization can purchase a versatile general ledger program with accounts receivable and accounts payable capabilities. I have seen similar programs for other systems that cost twice as much and don't deliver as much as *DDE* and *SW.* Now if only we could squeeze in a payroll program!

(Custom Software Engineering, 807 Minuteman Causeway, Cocoa Beach, FL 32931, tape $34.95)

—A. Buddy Hogan

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CC-DBM/LW — A Letter Perfect Correspondence System

If you've had your CoCo for any period of time now, you are probably getting tired of just playing games. Sure, you know that your computer is capable of much more, but what kind of things would you like it to do for you? Maybe you belong to a computer club and need some help with mailing out newsletters and the like, or perhaps you are contemplating the big job of mailing out all of those seasons greetings cards. Can you think of anything now that you would like your CoCo to help you out with?

CC-DBM/LW is a set of programs, written in BASIC, that will allow you to maintain a database, create and edit letters, print name and address labels, and merge your database with a letter for mass mailings. It is designed primarily as a correspondence system, but can also be used for other purposes as well. It is not, however, and does not claim to be, a full-blown database or word processing system. With this in mind, let's take a closer look at some of the details.

The system consists of three distinct functions. The database/mailer portion allows you to create and maintain your database, print a record, display a record, print name and address labels, and sort your database on any field. The letter editor portion allows you to enter and edit your letter, and to print your letter. Finally, the letter printer portion will allow you to scan your database file or letter, set limits on the printing, and merge the letter with a database file for mass mailings.

The first thing you will have to do when setting up your database is to define your parameters. You must have at least four fields, and can have a maximum of 10 fields. Each field, in turn, can be between five and 27 characters in length. The system has defaults for all of these values, which in effect set up your database as a name and address file (what this system is all about). Once you are through defining your file, you are ready to start entering your data. There is nothing fancy about this process, and you are kept informed as to the record number being entered, as well as the number of records that can still be entered before the file is full. You can get from 68 to 454 records in your file on a 32K machine, depending on how many fields you have and their total length.

Once you are done entering your data, you can then save your file. You can also sort it by any field, print any record, as well as change or delete a record. Printing name and address labels is also a possibility at this point, and there are several options to choose from. You can set tabs, the spacing between labels, the number of copies to be printed and print a test label with Xs in all four corners, in order to insure proper alignment of the labels.

Now that you have set up your database, you will probably want to write a letter to send to all of your friends. The letter is automatically initialized with your name and return address (after you have *EDITed* a few lines in the program), as well as the opening and closing salutations. These, of course, can be changed, but it is nice to have CoCo do most of the work for you. The letter can contain up to 30 printed lines, with a line width of 70 characters, which includes word wrap. There are no fancy editing commands here, and it is very similar to BASIC's editor. Once you are satisfied with your letter, you can print a test copy of it, or just save it out.

Now that you've spent what seemed to be an eternity entering data into your computer, you are ready for the big payoff. Load your printer up with paper, select the letter you want and the database to be used, and begin. Finally, your computer is performing a useful and tedious job for you, while you sit back and relax. Way to go CoCo!

CC-DBM/LW is a very good utility system that fills a real need. It is not full of extra features that you would probably not use anyway, and as such it is straightforward and easy to learn to use. It comes with several demo files, so you can start to learn how to use it as soon as it is loaded. The documentation is complete and explains how to use the system, but there could have been a bit more in the way of examples. One of the unusual features of the documentation is the inclusion of a flowchart of the major logic of the database portion of the system. If you are in the market for a full-blown database or word processing system, then you should look elsewhere. If, on the other hand, you are looking for a system to give you a hand with your correspondence, then *CC-DBM/LW* will do the job nicely.

(EVS Engineering, 9528 Suite 35, Miramar Rd., San Diego, CA 92126, $49.95 16/32K tape or disk)

—Gerry Schechter

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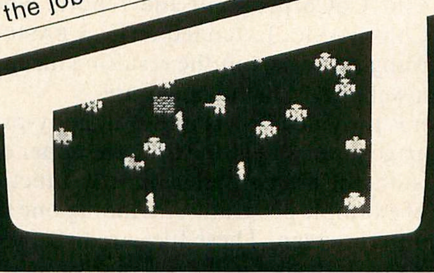

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The Dugger C Language Compiler, Version 1.2

By Richard A. White
***Rainbow* Contributing Editor**

The only C language compiler available for the CoCo Disk Operating System as opposed to *Flex* or *OS-9* is Dugger's *Small C,* Version 1.2. This is a machine language program that will run in 16K. I have not tested whether it will operate with the new CoCo ROMs and CoCo 2, and 64K CoCo owners would be well advised to consult Dugger's before purchase.

It is by no means a complete C, but it is a sufficient implementation that one can learn how to program in C with it. You can also do some fairly significant programming even with a small compiler like this. For example, I used Dugger's C to write a program for *the Rainbow* that examines a BASIC CoCo program and reports whether it should run in Color BASIC, Extended or Disk BASIC. It was basically a learning exercise, but the resulting machine language program well serves its intended use.

The compiler is provided on a single, non-copy-protected disk with a 40-page manual. On the disk are upper case and lower case versions of the compiler, library function files and a number of example programs, including one that lists an ASCII file to the screen. These files are listed on a note sheet that comes with the documentation. Not listed on the note sheet are ADDSEQ and STRIPIT which will strip sequence or line numbers from an ASCII file or add them back in. This means that you can use an editor that produces line numbered code and use STRIPIT to prepare an unnumbered text file for the C compiler. The compiler produces unnumbered assembly language that is to be run through an assembly program that is not provided. If you have an assembler that requires line numbered assembly language, use ADDSEQ to line number the file.

The Dugger C Compiler does not support the float type of variable. However, library functions are provided that access the BASIC ROM's floating point routines and use other ROM routines to print floating point values. This is not standard C practice, but at least is in the spirit of the language, in that functions are used to do anything not in the compiler itself. It is better that what is in the compiler conforms to standard C practice or not be there at all.

The compiler supports integer (two-byte), character, array and pointer variables. Long integer and float variables would be nice to have and are promised for Version 2—due around the end of the year. Most C operators are supported, though there seem to be a few variations in logic operator practice from standard C.

In the control statement area, IF . . . ELSE and WHILE are present with FOR scheduled for Version 2. At the end of the documentation is a listing of standard C elements and which version they are scheduled for. I have had a need for SWITCH . . . CASE which is not due until Version 3. Though you can completely control any program using IF . . . ELSE and WHILE, many published C routines use FOR which will be in Version 2. Reserved words, normally written in lower case, are asm, break, char, continue, define, else, endasm, if, int, return and write.

Reserved words "asm" and "endasm" are used to include

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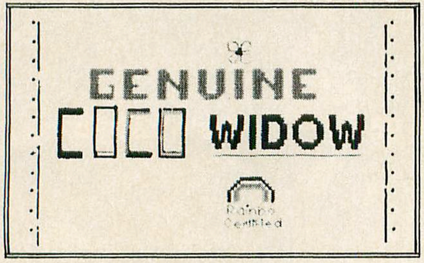

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assembly language sequences or assembler directives in the C text file. One important use of this to assembly language programmers would be to include refined and efficient assembly language routines in a C program or function. Compiled code is seldom as efficient as carefully-refined, hand-written code because some compromises for generality must be made in the compiler. I use asm and endasm to include the LIBS assembler directives which we mention later. Note that the compiler produces fully relocatable code and included assembly language should also be relocatable.

Following normal C practice, all I/O routines are in library functions. There are no graphics screen functions provided. As supplied, these functions allow output to screen or to disk. Input is from keyboard or disk. Not documented is the function prttog( ). A prttog(0) sends output to the printer rather than the screen, while prttog(1) turns the output to the printer off.

The printf( ) function is a simplified version of the standard C library function. This is appropriate since it only has to print integers, but will need to be revised for a compiler supporting float variables.

The manual is a fairly terse reference for the compiler. While some examples are given, there is no hope of learning C from this document. Standard C is that described in "The C Programming Language," Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall, 1978. Since Dennis Ritchie wrote C in 1972 it is nice that people agree his writeup is important in setting the standard. But, after the first chapter, Kernighan and Ritchie get deep very fast, and yet another level of digestibility is needed. So, start with "The C Primer," Les Hancock and Morris Krieger, McGraw-Hill Book Company, 1983. This book is a jewel. It takes the reader step by step through the basics of C with enough explanation and wry humor to make the trip a fairly jolly one. If you get serious, get Kernigan and Ritchie as well. One word of warning. Both these books describe C as implemented on a PDP-11/45 minicomputer. So descriptions of the compiling process and files inclusion do not apply to the Color Computer or to most other micros, for that matter.

Now, a few words on the process. Write your C program in any text editor that supports the full CoCo set of keyboard characters. Some standard C characters are not supported by the Keyboard and alternates are used. *Telewriter 64* and Nelson's *Super Color Writer* can be used as can most basic text editors. Dugger is close to releasing a text editor that is being written in C. After the program is saved to disk, the compiler is loaded and compiling instructions issued. You may compile a number of files in sequence that will be saved as one assembly language file. The Library functions are included in this way if your assembler does not have a LIBS command.

In summary, Dugger's C is a good value for the price. You can learn a lot about C using it and can write significant and useful programs, even with its limited set of commands. I contrast this with a couple of BASIC compilers I have seen that were so limited they were nearly useless. The upcoming Version 2 will bring some important improvements, though even this will not be a complete C. Thus, transportability of C programs from other machines without some rewrite will not generally be possible. Your alternatives are to move to *Flex* or *OS-9* and pay over $100 for a C compiler. And, Bruce Dugger has advised that owners of Version 1.2 will be offered an upgrade to Version 2 when it becomes available.

(Dugger's Growing Systems, P.O. Box 305, Solana Beach, CA 92075, Disk TRSDOS $49.95)

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Software Review

Disk Graphics
Multi-Faceted, High Quality

By Ed Lowe

I had thought to myself that, come the day when I finally get off the ground in this high-tech business, I'm going to need a graphics department to put out scads of beautiful multicolored charts for information-hungry clients. A scan of computer magazines for available high quality graph generators and printers, however, left me in the "one of these days" mode. That is, until recently. With the advent of Radio Shack's new *Disk Graphics* package, I can now envision a neat little room under the glow of a flickering TV screen (or even a monitor) hooked up to a minimum 16K CoCo and disk drive or two, driving a CGP-115 Color Graphics Printer, a graphics capable dot-matrix printer (for fast "proofs"), and a whiz-kid to run it all just for the experience. Think of the return for the investment! Line up, customers!

When I saw this package, I also opined that Radio Shack sent out a very important signal by marketing *Disk Graphics*: they now intend to fully support the Color Computer with top rate applications programs with this, as the first of hopefully more that have uses even outside of the hobbyist's den. Could it mean that, at long last, "they" too are recognizing CoCo's power and potential?

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In any event, this review of a major Big Daddy product was seen as a plum, a bouquet from *Rainbow*. I think you'll be pleasantly surprised at the power, speed and high quality product of *Disk Graphics*.

Let's first put "graphics" into context. Radio Shack's new *Disk Graphics* 1.4 (variously spelled with and without the final "s") is an outgrowth of its cartridge package recently announced in the RSC-9 catalog. "Graphics" here has nothing to do with drawing space invaders or frogs on the high-resolution screen. What we'll be dealing with are pie, bar, line, point, and key charts, their generation, display, storage, and so forth.

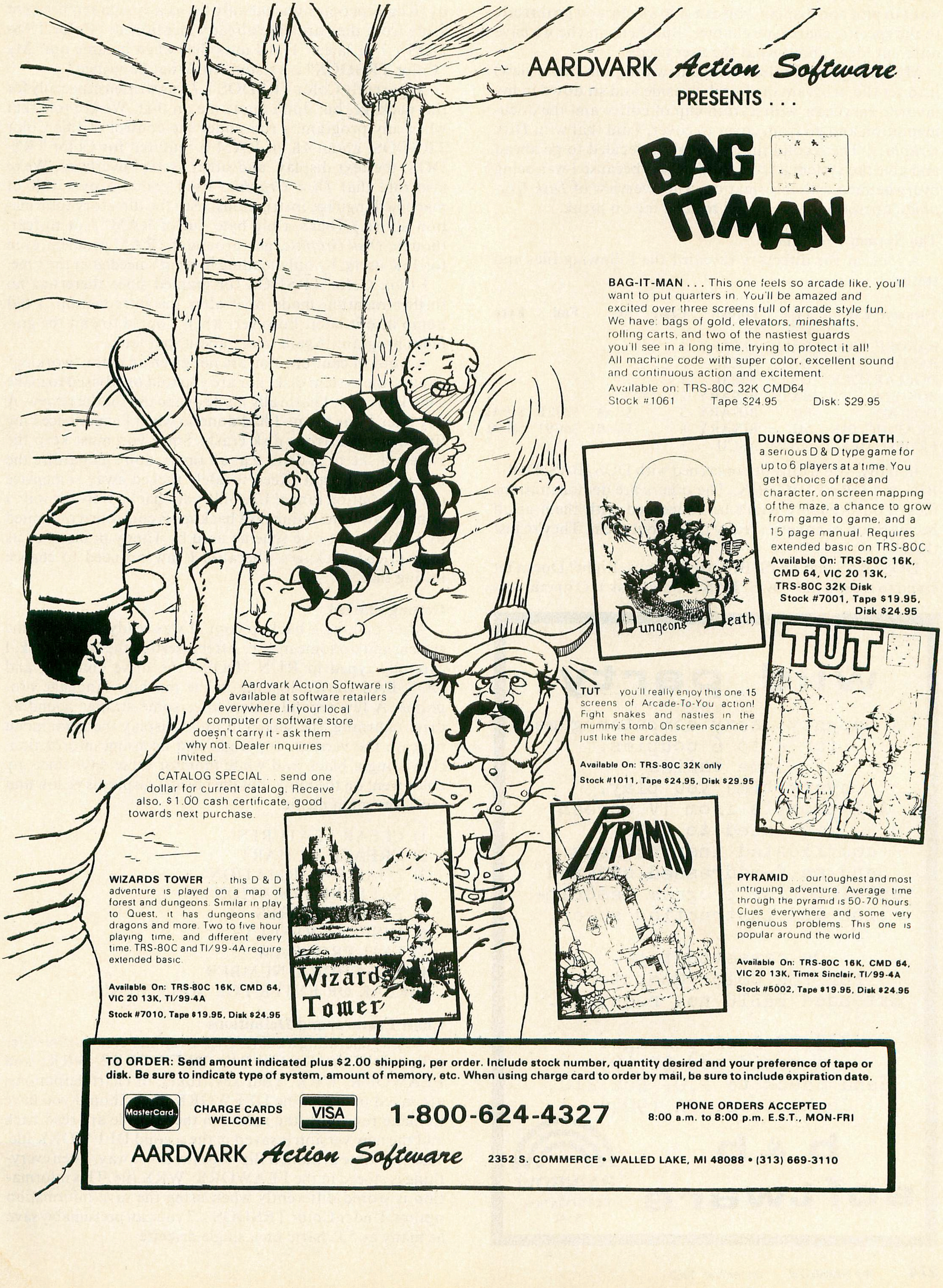
Disk Graphics will let you plot a variety of charts and display them on the Color Computer screen or print them on a graphics or graphics-capable dot-matrix printer. The folks in Texas even venture to say: "With its multi-faceted chart-plotting capabilites, *Disk Graphics* has many practical, business, scientific, and engineering applications. And, with its easy-to-follow menus and prompts, *Disk Graphics* lets you draw very sophisticated charts . . . quickly and with a minimum of effort!"

Even though I know that both you and I have heard those words before (to someone else's music), this time I think we have a true hit on our hands. I've been working with this package licensed to Tandy by Robert G. Kilgus for some three weeks now and, though I still don't know for sure what I'm doing in all cases, I'm convinced it's not their fault. Fact: I'm not the world's brightest and I haven't spent every waking moment on it, but I'm no dunderhead either. So, even I can generate beautiful charts using their examples and samples and a few of my own devising.

There are a few things about *Disk Graphics* I just can't seem to get down pat. I'll discuss those as we go along but, frankly, what has led to this lack of self-confidence while using *Disk Graphics* results from the layout of its documentation. I had expected an absolutely perfect example of documentation, but I discovered that even "they" may have some problems perceiving just what the user may need to guide him. I'm not talking about the computer addict; I'm talking about the kind of person who buys an applications program to get a job done. The kind of person who isn't all that interested in the technical "hows," but rather in plugging the program in and getting results without having to burn a barrel of midnight oil. In some respects, I think that person will be a bit let down. But let's take a look at the documentation and then discuss some of the practical hows.

Disk Graphics' documentation comes handsomely packaged like its big brothers. That is to say that it is encased in a very nice, colorful three-ring binder. On opening the binder, the first two items you run across are an applications and system version log for your maintenance, and your software registration card (postage paid). Next comes a pocketed plastic insert, which holds the system disk. It could also hold your backup, assorted pens and pencils and notes. A four-page quick reference chart of standard sized very heavy stock paper containing most of the system values is loosely inserted.

The meat of the documentation is 86 typeset pages on heavy paper, complete with figures and sample charts all prefaced by a contents page. This contents page quickly points you to a general subject or chapter heading only (12 chapters and five appendices). This is not an index. In fact, there is no index or way to quickly locate specifics. And here, to my mind, is where the (my) trouble starts. Each chapter presumably covers a complete subject or type of chart. One would expect an index of sorts to a manual as



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AARDVARK *Action Software* **2352 S. COMMERCE • WALLED LAKE, MI 48088 • (313) 669-3110** large and complex as this. It suffers without one. I don't agree with their assumption that, for example, if you only want to plot and display, you can skip all else and go directly to the specific chart type chapter. But then, maybe we have different ideas about what the user needs.

My usual plan of attack with a new program (for review) is to set the program tape or disk aside and sit down in my favorite easychair with a fresh cup of coffee and the documentation and go from cover to cover. I did that with *Disk Graphics*. The second time through, I decided to go ahead and give the system a try. I think it was because I was being overwhelmed with information. The overview of *Disk Graphics'* operation was enough to send me on break.

The System Programs

A look at the directory revealed the following files and status:

Filename/Ext	Type	Format	Gran	St	End	Exec
BASDEF/BAS	BASIC	BINARY	1			
BASDEF/DEF	DATA	ASCII	3			
DOLLAR/DEF	DATA	ASCII	1			
BOS/BAS	BASIC	BINARY	2			
DOS/BIN	ML	BINARY	3	$EA4	$20EB	$10A2
GRAPHIC/BIN	ML	BINARY	8	$2ABF	$6C97	$0000
PROFIT/DEF	DATA	ASCII	1			

Initially, you'll only be concerned with DOS/BAS, DOS/BIN and GRAPHIC/BIN. The others are demonstrations files. You probably won't be concerned with them at all because you're not even really told about them. They're just there!

DOS/BAS and DOS/BIN are obvious. Right? Doesn't it stand to reason that DOS/BAS handles disk I/O operations since CoCo disk I/O can't be accessed by machine language programs? Sure it does. But listen to what the Shack/Tandy/Kilgus people nonchalantly list as a system requirement aside from the hardware already mentioned: "Color TRSDOS 1.7 or later." Did I miss that when it came out? My "Color TRSDOS" is version 1.0. What happened?

Apparently Color TRSDOS 1.7 was written especially for this package, but don't quote me on that. We are told that when any program is run under the control of this Color TRSDOS, about 4K of RAM is required for Color TRSDOS, the text display, and other system overhead. We're also told that *Disk Graphics* itself contains over 16K of machine language instructions. (See the directory information above.) That's a big byte out of RAM! Not to fear, though. *Disk Graphics* gets around the RAM problem, even for 16K users, by only loading in what's needed at the time.

I took Color TRSDOS for granted since there was no further mention made of it after the introduction. I did bump into it later, however, when I opted to exit the graphics program. Again, more about that later.

A word of caution: You are not given an extra "working" copy of the system disk, nor are you told or advised to make a backup copy. I naturally made one to use for the review. A day later I was happy I had done so when I experienced my first truly disastrous disk crash! Since you must keep the system diskette in drive 0 at all times, don't jeopardize the one you've bought. Keep it safely tucked away someplace out of radiation range! Use only your backup. By the way, I don't know if the number of backups is controlled or limited by software—a nice scheme used by Tandy in many of its high priced packages—because I saw no need to chance testing that.

Getting Started

After making a backup copy, I was ready to fire up the system and do some magic. After inserting the system disk, I carefully typed in RUN "DOS," the drive churned, and DOS/BAS started loading in the machine language programs. A few seconds later, after some strange sounding drive churning, the screen lit up to display the main menu beneath the version, copyright and licensing information. (I'm using a black and white monitor these days since my color went on the blink, but the normal display is yellow and red.) The main menu:

```
1) CLEAR FEATURES
2) CREATE A CHART
3) LOAD INFORMATION
4) SAVE INFORMATION
5) EDIT FEATURES
6) DISPLAY RESULTS
7) EXIT PROGRAM
PRESS CHOICE NUMBER
(BREAK OR ENTER FOR MAIN MENU)
```

Chart Features and Definitions

When generating a chart, *Disk Graphics* creates three files called DEFWORK1/WRK, DEFWORK2/WRK, and FEAWORK/WRK. Your keystrokes, or chart definitions, are saved in one of the DEFWORK files. Should you have to make revisions, the values in the first file are read back and the new version is saved in the second DEFWORK file. The next time around it flipflops the other way. Then everything is stored in the FEAWORK/WRK file. This information is stored differently when using the save information option. Under Color TRSDOS 1.7 you can presumably save as many as 53 charts on a single diskette.

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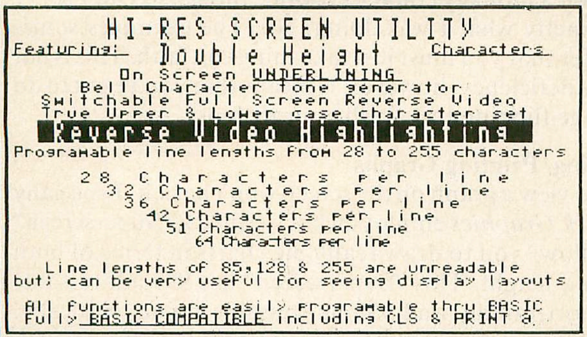

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A constant distinction is made between "features" and "definitions," but I've yet to fully appreciate that distinction.

Graphing

The documentation contains ample definitions of each type of chart and suggested uses. Selecting the "Create a Graph" option (2) from the main menu runs you through a very fast confidence check which checks for previous charts and whether any features should be cleared out or not. Then you're asked what type of chart you wish to create: pie, bar, line, key, or point. Again, after a single keystroke and some drive churning, you're in the data prompt mode. I like this mode, because that's where the action is. To enter data, you simply use the arrow keys to move the blinking cursor to the bracketed input fields, type in the data and move on. When you've completed a specific segment, you simply press [ENTER] and the data is automatically stored. you can escape to the main menu at any time simply by hitting the [BREAK] key.

Generating a chart using the samples provided is a breeze. At least one sample is given for practicing each type of chart. The only one I didn't try is the point chart, mostly because I am underwhelmed by the significance of a point chart. But then I had my work cut out for me in other areas trying to keep myself mentally attuned to the subject at hand.

In defining a chart under *Disk Graphics,* you're basically concerned with the following information:

Chart title
Overall height
Overall width
Chart position
Shading
Color
Erasure
Periods
Items per period
Scale

To repeat: I followed the instructions and had the sample charts on the screen with a minimum of trouble. But sometimes I felt a monkey could have done the same. Did I really know exactly what I was doing? No. The examples sometimes infer that you must just take things on faith. This is not a serious deficiency, however. It means that you've got to do some page flipping to refresh your memory.

Displaying/Printing Graphs

Just to view a graph on the screen won't hack it. Especially since *Disk Graphics* employs what is called a "Superscreen" which allows you to draw really big charts in terms of both width and height. This "Superscreen" has 999 addressable points horizontally and 999 addressable points vertically. These "Superscreen" points are not to be confused with CoCo's screen pixels. Draw a chart at the maximum limits of "Superscreen" and you will only see a small, small portion of it on the screen at any one time. You can scale this big one down in increments of ½ the previous size to (to ⅛th) and move the scaled version around in relative position, but you need a printout.

To use *Disk Graphics,* you must have: A minimum 16K CoCo with Extended Color BASIC; a color TV (only aesthetic penalties for using a B/W); disk drive and controller; and a COLOR TRSDOS 1.7 or later (?). Optional equipment includes: Cassette recorder for loading charts created with the ROM version (26-3157, $39.95) and a printer with a graphics capable dot-matrix, or the CGP-115 Color Graphics Printer (26-1192).

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I decided to go for the four-color reproductions right away. I could always unhook the Okidata (no graphics capability yet), uncover the LP VII and hook it up for black-and-white prints. (I knew there was a reason I still had it!) I wanted as much of the complete equipment setup as possible. So, I made an arrangement with one of the friendlier Radio Shack store managers in the area to let me "borrow" a CGP-115 to do a review of one of "his" company's major new pieces of software.

To get a display or printout, you merely make a one-keystroke selection from the following menu:

```
DISPLAY METHOD?
1) 96 x 128  4 COLOR
2) 192 x 256  2 COLOR
3) 999 x 480  B/W PRINTER
4) B/W PRINTER (RIGHT HALF)
5) 480 x 999  4 COLOR PRINTER
6) COLOR PRINTER (UPPER ½)
PRESS CHOICE NUMBER
(BREAK OR ENTER FOR MAIN MENU)
```

Selecting 5 started the CGP-115 on its magical journey across the 4½"-wide roll paper. I'm still amazed by that little machine. Its output is amazingly clear and crisp and it's no slouch on speed, either. The size of a normal chart, using system height/width defaults (192, 256) to match the screen, is 1½" high by 2" wide. The largest size I tried was 600 points by 600 points. The color printer atually handles such large sizes in two segments. It even punched out perforations, along which I could scissor to tape the two segments together.

A significant deficiency I found in the manual was in relation to the "Superscreen's" height and width. While the feature is discussed at some length, there is no matrix chart which shows you where a location of, say, height 140 and location 211 will fall on the screen. I suppose by Christmas I could probably have one drawn up to give me an idea of where things fall in relation to 0,0 in the lower lefthand corner, but . . . until then, I'll just have to imagine point parameters in my head. That's asking a lot of someone like me!

Anyway, that vertical bar chart came out at a little over 4¾" by 4¾" on the CGP-115. The LP VII printed the same chart out at 10" by 10" with extremely good definition even for it. (It also took 13 minutes to do the job; the CGP took a little under six minutes.)

Users with a 32K machine will discover a very nice built-in feature in *Disk Graphics'* print spooler. You won't have to sit on your hands during printouts. Unused portions of RAM are used to spool data to the printer and you can go about your business creating other graphs or whatever. While in this mode, you can check on the print status at any time to see exactly how many more bytes have to be sent and then return to what you were doing. If you wish, you may even abort printing with absolutely no ill effects.

Saving and Loading Information

As you can see from the menu below, this presents no real problem:

```
SAVE/LOAD FILE NAME   [CHARTDEF]
WHICH DATA?    [1]
  [0=FEATURES, 1=DEFINITION]
```

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```
DEVICE      [0]
  [0=DISK, 1=TAPE]
DISK DRIVE    [0]
MEMORY CONTAINS:
XXXXX FEATURES
XXXXX DEFINITION
XXXXX FREE GRANULES (DRIVE 0)
```

If you don't specify a filename, the system defaults to CHARTDEF. Values in brackets are system default. Use the arrow key(s) to position the cursor over the value if you want to change it. For example, you may save to or load from either disk or tape simply by placing the cursor over the zero and changing it to "1" for tape or hitting [ENTER] for the default value.

A Problem?

I had some problems understanding precisely how to redefine all of the features to change size, position and so forth to get different printouts, both screen and printer, of the same basic data. In the course of experimenting, I locked up the system and ultimately totally wiped out my backup disk! *Disk Graphics* has its own error messages. The first one I got indicated that I (?) had failed to close a file. Unfortunately, I had no way of knowing how to recover from this condition. I later "rediscovered" an obscure and oblique remark way in the back of the manual under the section on saving and loading a features file which says "Important Note: If the system 'hangs up' for any reason, press the [RESET] button on the back of the Color Computer. When the message 'FILE NOT CLOSED AFTER CHANGES' appears on the screen, press [ENTER] to return to the *Disk Graphics* program." Too late! Because I am cautions of hitting the [RESET] button with a program disk in the drive, I had done something else, including taking the disk out and doing a cold start. The system started giving me I/O ERROR messages then, so I knew I was in deep trouble. The manual was no help and that's when I really started to bemoan the absence of an index with an entry such as "In Case of Trouble" or even "In Case of a Delta Alpha Attack" do such and such.

I shut the manual, concerned now only about my system. Repetitive I/O ERROR messages. In an attempt to reformat the crashed disk, I found that I was totally unable to do so and therefore out of business. So, in classic southern fashion, I shut the whole system down for almost two days and went cold turkey. When I got back to turning it on again, I had no problem formatting a fresh diskette and backing up the program. Explain that one, please.

The same thing occurred once again days later, but the second time around I kept hitting the [RESET] button and [ENTER] like the man said, finally recovering as if nothing had happened. I still don't know what I did wrong in either case! (I did notice during the first crash that one of the DEFWORK files had jumped from the normal 1-2 grans to 29 in a matter of minutes.)

Color TRSDOS 1.7

As far as I can determine, Color TRSDOS 1.7 is only for this package and is not otherwise very useful. The fact that the system diskette must be in drive 0 at all times limited investigation under my one-drive system.

Color TRSDOS 1.7 (11/82) is visually accessed by selecting Option 7 (Exit Program) from *Disk Graphics'* main menu. In addition to the copyright and licensing notices, the following are displayed on the screen:

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3. START CLOCK DISPLAY
4. DISK ALLOCATION MAP
5. COPY FILES
6. DIRECTORY

Exit to BASIC: This option permits you to properly exit and reconfigures all RAM pointers (back to 22823 bytes of memory for a 32K disk-based machine). To get back into *Disk Graphics,* you must again enter RUN "DOS."

EXEC a Program: Not selectively found. Only executes *Disk Graphics* on the resident diskette, although it may be possible to execute another program *SAVEd* on the system diskette.

Starting the Clock Display results in an HH MM SS reversed video clock in the upper-righthand corner of the screen. I could find no way to set this clock, so what you have is an elapsed time clock only. (This clock and many of this section's features will look familiar to some of you.)

The disk allocation map (Option 4) will read two drives and indicate which sectors have data written to them. Again, since the system disk must be in Drive 0 at all times, I could only read data on it. Attempting to read another, totally unrelated diskette resulted in "SYSTEM FAILURE SYSTEM FAILURE" across half the screen and a complete system lockup. The only recovery was to *RESET* and start all over.

Files copying: Again, I was restricted to the system diskette. Although there are the usual options concerning source and destination filename/extension and drive(s), I could find no use for this. The program asks the question "If drives are the same, are you using different diskettes (Y or N)," which leads me to believe that you can bypass the "N" default and possibly copy a *Disk Graphics* or maybe even unrelated file to another diskette.

Directory: Reads the directory of the resident diskette. Good for finding out what features and definitions files are stored.

One more thing about these features: once you select one, you must follow through with it and do some. There's no change of mind escape.

I'm surprised that there is not one word on running and using these six Color TRSDOS 1.7 options. Without inclusion in the documentation, they have only limited application and at first glance appeared to be only bonus additions.

Summary

Radio Shack's new *Disk Graphics* package, even more so than the original ROM version, may be viewed as a major piece of quality software with definite applications in the business world. While it may not rival some of the kilobucks systems, it offers a viable alternative. Its product is crisp, clean and of extremely good quality. The fact that you may vary the output's size beyond the normally diminutive printout, especially in four colors on the Color Graphics Printer, is a real boon. Because of its outstanding features I am more than inclined to overlook what I consider some of the documentation's shortcomings and would have no qualms at all about recommending the complete hardware/software package to anyone in need of a good, down-to-earth yet inexpensive in-house graphics capability, especially if they were going to use it in a small business environment.

(Radio Shack, Catalog No. 26-3251, $49.95)

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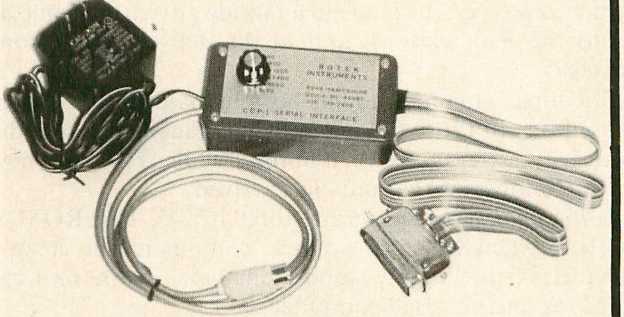

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No Matter How You Say It, *Colorspeak* Is The Last Word

In the not too distant future, programs for the Color Computer will feature clearly intelligible voice-overs on a regular basis, thanks to *Colorspeak*, a voice synthesizer created by Bumblebee Software of Chicago.

Yes, there already are some programs that feature audible commands. But in far too many cases, the effect is like the sound of doom, accompanied by a gusting effect that can blow you out of your chair.

Not so with *Colorspeak*, which comes complete with a demonstration program, instructions that seasoned programmers can immediately use, a lengthy phonetic speech directory and the heart of the program—a Votrax SC01 Phoneme Synthesizer.

The potential of *Colorspeak* is clear in the demonstration program, which includes a spelling test, a math quiz, a sampling of words, graphics accompanied by voice-over, and the opportunity for you to experiment with your own vocabulary. It is easy to imagine the synthesizer being used as a homework aid, for automatic phone answering, a talking dictionary, a tour guide in a talking adventure game, an aid to the handicapped, and in the delivery of personal messages.

Of course, anyone who has been in major airports lately or used one of those talking copying machines knows that voice synthesizers have been in for a while. The good news for CoCo lovers is that ours has arrived.

Colorspeak has its program stored in a 4K-byte ROM, so it's there when you turn on your computer. The creators claim that it is the only stand-alone voice synthesizer cartridge for any personal computer.

The Votrax can produce 64 different phonemes (the basic sounds of speech) and four inflection levels, resulting in 256 sounds in which to produce words. (For the mechanical-minded, a technical data sheet is included in the appendix to the instructions.)

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The most difficult part of using a phoneme synthesizer, the authors explain, is to determine which phonemes to string together to produce a word. A list includes all the phonemes that the program is capable of using. The process of selecting the correct ones may involve sounding out the word, identifying the number and types of sounds contained. The correct phenomes for teacher, for example, will be: T,E1,T,CH,ER. For the word station, they would be: S,T,A1,AY,SH,UH3,N.

If phenomes are not your thing, and I'll have to admit that I'm among that group, then you can experiment with the text-to-speech mode, trying something like tee-chur or staechun to get the correct sound.

There's also a spelling mode, which I found to be a lot of fun in demonstrating to onlookers how clearly CoCo could pronounce the letters of the alphabet.

The following listing is included in the instructions to get you started writing your own programs:

```
10  REM DEFINE SPEECH STARTING ADDRESS
20  DEF USRO=49152
30  TALK$="/T BASKETBALL ."
40  REM SPEAK THE STRING
50  A=USR0(0)
60  GOTO 30
```

Line 30 connotes which mode you are in and TALK$ string precedes whatever is to be spoken. If you're a veteran at programming, you should have no problems in expanding upon this example. If, on the other hand, you're new to the game, you'll probably be frustrated by all the "EDIT 30s" you'll need to utilize before getting comfortable with the procedure.

The folks without Extended BASIC, relax. The program also includes a similar routine for you. They've thought of everything.

Colorspeak was originally conceived for 16K machines at a time when the majority of users were limited to that capability. The early versions did not work on computers with more storage space. Recognizing the speed with which 32K and 64K upgrades were gaining in popularity, the creators went back to the drawing boards—and one version now fits all, with some modifications: For 16K machines, the user needs a 1 Clear 1000,15700. For 32K and above, the command is 1 Clear 1000,32000.

Colorspeak is in no way a program for the beginner or for those who are merely seeking a new game for their collection. Oh, you could have fun using the demo program, but without the skills to use it at its fullest potential you would soon tire of it or become frustrated.

For the serious programmer and the professionals in the wide-open CoCo market, *Colorspeak* will soon be indispensable because the game fanatics and those who use the computer for educational purposes are going to expect good voice-over programs. And until someone can concoct a chip that plugs right into the computer board like the SAM chip on the 64K upgrades, *Colorspeak* is, indeed, the state of the art.

(Bumblebee Software, P.O. Box 25427, Chicago, IL 60625, synthesizer with demonstration cassette tape, $169; user manual, $4)

—Charles Springer

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DESERT SOFTWARE
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Articulator Could Be Good But Needs Documentation

In a recent issue of *the Rainbow*, I received a game which began with a spoken greeting, and I asked, "How did they do that?"

I still don't know how they did it, but one way that such an effect can be accomplished is to use *Articulator*. That's a 16K machine language program that will "read" sound from a tape, or sound spoken into the tape recorder's microphone, and convert the sound into digital data that can be stored in the computer's memory, played back through the TV speaker, and stored on tape in digital form for use in your own programs.

The program is written in a relocatable form. You can load it higher in memory to make room for a long BASIC program, or lower to make room for a longer soundtrack. According to the instruction sheet, the machine code takes up 800 bytes, and any RAM above that is available for soundtrack storage.

As the documentation explains, the capacity of the soundtrack storage will depend mainly on what kind of sound you are recording. Low frequencies such as male voices will take up less space than higher ones, and some phonemes such as "ss" and "ch" will use up more memory.

First, the program is used alone to read in and digitize your soundtrack. Commands, explained in the instructions and summarized in the on-screen menu, are fairly simple to understand and use. M and A are used to toggle the motor and audio on and off. The letter "M" flashes on the screen if you are turning the motor on. There is no such indicator for the audio. R "reads" the audio, and digitizes and stores it. S makes the stored soundtrack that was saved by T.

There are also commands that are supposed to shorten and lengthen the soundtrack. I had no problem in shortening the soundtrack, but lengthening sometimes caused the computer to hang up when I then tried to make it speak.

Obviously, the program by itself is of limited value. You have to be able to use it with your own program. Unfortunately, this is where the writer of the instructions didn't do a good job.

Seven entry points (in addition to the start point) are listed. Some of them are clear. If you *EXEC* or *DEFUSR* three bytes above the start point, the soundtrack will start speaking. This is the same as pressing S from the menu. Similarly, there are entry points that substitute for the I and R commands.

The remaining entry points listed are: "set track start," "set track end," "get track start," and "get track end." I was unable to figure out how these options work, and the instructions were no help.

Neither the instruction sheet nor the cassette label has an address or a phone number to ask for help.

If you try to read in a voice recording made of a CTR-80A, you may be disappointed with the results. It takes a hi-fi quality sound recording to produce a decent soundtrack.

On the whole, the good folks over at 29 Enterprises have come up with a pretty good idea. If they'll just take some time to iron out the bugs, and write some documentation that is worthy of their programming effort, I can see *Articulator* becoming very popular.

(29 Enterprises, 1208 Country Ct., Cary, NC 27511, tape $20)

—Neil Edward Parks

RAINBOW

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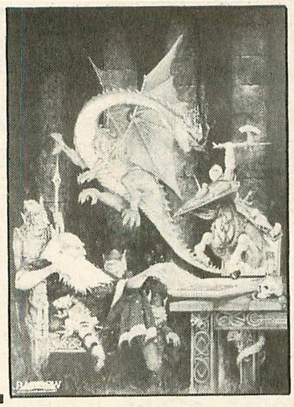

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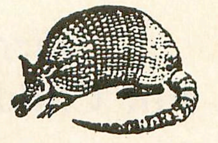

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Wizard's Magic For Children, Not Adults

I must admit that I was really looking forward to *Wizard 64* being a great adventure game. After all, the flyer with the disk says, "An original multi-player adventure for the 64K Color Computer." The only other thing the flyer mentions is how to load the game from disk or cassette and have fun. But still, this is the first adventure I have seen made for the 64K CoCo (16K and 32K versions are also available).

The introduction is interesting. You have to go across a lake and forest, reach the mountains and get into the tomb. Find the treasure and escape. In order to help you survive the journey, you have three choices out of the following six items: a suit of armor with sword and shield, a charm of protection, a chain mace for strong ones, a week's food and water, a spell to repel attackers, and a small sack of gold. After choosing your means of defense, you are shown a point chart with your "Life," "Ability," and inventory. The adventure does have the ability to accept up to four players' names with one person being the leader.

Before you start the adventure you are shown a graphic map of an "inn," lake (in blue), forest (in green), and mountains (inverted Vs in high-resolution). You may return to this map throughout the game. However, regardless of where you are, the map is always the same, even if you are in the tomb.

The introduction, showing that you can move north, south, east, west, (m)ap, or (p)oints, is the best part of the adventure. Once I got into the game itself I felt myself "Slideing," as it is spelled in the game, into a novice's fantasy. Attacks by a "Greel," "Warog," "Suit of Armor," "Zombie," and the like, are met too numerously. Each encounter asks you to either fight or cast a spell. If you fight, two graphic characters jump around the screen for a varied length of time and, for no particular reason, you either win or lose. If you cast a spell, graphic circles rise, accompanied by music. Upon conclusion, you are either told your spell worked or did not work. The means of notification is, "Yipee!!! The Warog Has Been Burnt To Ashes!!!" Sorry, but "Yippee" and "Hurrah" do not impress me.

Finally making it to the Wizard's tomb, you meet a little man whom you must attack in order to gain entrance. He speaks to you, but nothing he says is in quotes. If you defeat him you get, "Hurrah!!! The little man has been burnt to ashes!!!" And you gain entrance to the tomb.

Traveling through the tomb, you find different rooms and passage ways that have various objects in them but you may only travel north, south, east or west. You cannot examine or look at anything. When you get into the depths of the tomb, after being attacked by things, and either fighting or casting spells, you come to the treasure and then make your way out of the tomb. The tomb has rooms that have, "Green slime oozing down the walls . . . this is a creepy place!!!"

O.K. Time for me to turn this over to my kids. Faster than an "open sesame," my children got to work on the Wizard.

They actually liked it! They did not mind the numerous attacks or the Yippee's. It was right on their magic carpet ride. It took them about 15 minutes to complete the whole adventure.

So how does *Wizard 64* come across? If the instruction flyer said, "For children — Ages 9 to 13," I would recommend it over my objections to spelling and grammatical errors (although there is no excuse for them). But as an adult looking for something magical in an original adventure for the 64K CoCo, I feel the Wizard has run out of spells.

(Skyline Software, Soft City, 442 Sunnyside, Wheaton, IL 60187, $21.95 tape, $23.95 disk)

—Michael F. Garozzo

Hint . . .

Undocumented

I have discovered a few *EDIT* subcommands that are not documented in the Extended BASIC manual. I found these when going through a model I quick reference card and decided to try them. They are as follows:

A: Cancel all changes, list line, continue editing.
Q: Cancel all changes, stop editing.
E: Keep changes and stop editing. (same as ENTER)

I have never seen these subcommands published in any reference to the CoCo, although I can't believe that no one else has discovered them. The A and Q can be very useful if you make a goof and don't want to try and piece together a line or retype it.

—Craig M. Arnold
Dallas, TX

Editor's Note: This hint was published in the August 1981 edition of the Rainbow (Vol. I, No. 2) but it's time we shared this with the many readers who've joined us since that mighty nine-page issue.

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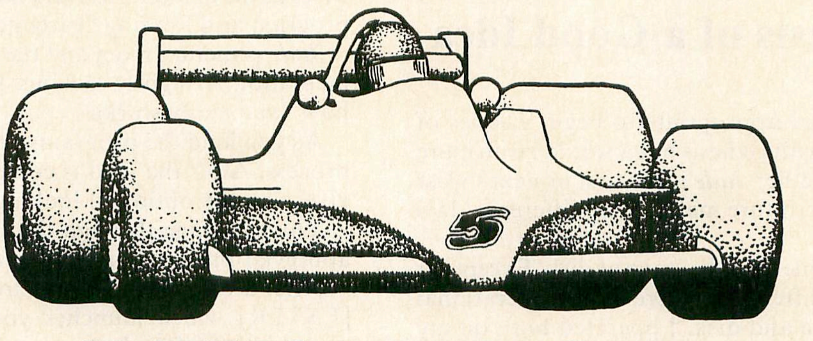

REVOLUTION!

You accelerate hard down a long straightaway, braking heavily at the end for a hard corner. You slice smoothly through the esses, and then boldly keep the power on for a fast sweeper. The Ferrari drifts dangerously near the edge, but you make a tiny correction in the steering, and you are through.

The finish line flashes by, and suddenly you are in the pits. The car falls silent. You see your lap times being held up. Your final lap was a new lap record! At last, you permit yourself a small smile.

You have mastered this powerful car on a difficult track, driving with the assurance and precision that comes only from long hours of practice.

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FANTASTIC ACTION

Revolution uses high resolution, machine language graphics for action that is smooth and fast. The emphasis is on authenticity in the control and motion of your car. As in driving a real race car, accuracy and precision in your driving are what counts. Frills and non-essentials have been left out.

PURE COMPETITION

Like a real race driver in practice and qualifying sessions, you compete against the clock and against the existing lap record for that track. *Revolution* records the lap records and the name of the person who set the record, so you always know who reigns supreme on your favorite track!

DESIGNED WITH YOU IN MIND

Revolution is menu-driven, and self explanatory. Information screens tell you what you need to know. When you're ready to play, a menu of the names of all your tracks is displayed, along with the lap record for each track and the name of the person who set that lap record. You select a track with a single keystroke, and *Revolution* takes you there.

A NEW CONCEPT

Revolution is a unique game, because it allows you to create the most important part of any race game: the track itself.

The first time you run *Revolution,* you will be able to choose from several tracks and cars which are included with the game.

But, with *Revolution,* this is only the beginning! You can create as many tracks as you like. You can make each new track as difficult or as easy as you wish. You can make easy ones to begin with, and tougher ones as you become more skilled. You may find creating tracks to be almost as much fun as driving on them!

You can save your favorite tracks to run on again whenever you wish. *Revolution* will automatically add these new tracks to the menu. And you can exchange your favorite tracks with other *Revolution* owners.

Be careful, though, about letting your friends play this game. They may not want to let you have your computer back!

THE EARLY *REVOLUTION*

A prototype version of *Revolution* was published in the September, 1982 issue of Rainbow magazine, under the name *The Track*. The response to *The Track* has been terrific.

Revolution has all the features that have made *The Track* a favorite, and *Revolution*'s fast, high-resolution machine language graphics are dramatically improved over the prototype's.

REVOLUTION NOW!

The original *Revolution* for the TRS-80™ Color Computer requires 32K and one disk drive. A new cassette version has action just like the disk version, and similar track-saving features excluding a menu of available tracks. The cassette version will run on a 32K Color Computer or TDP-100. You can upgrade to the disk version later, too, for a nominal fee.

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Jude is Genesis of a Good Idea

It may have been more appropriate to begin a series of computer Bible studies with Genesis but it would be no more welcome than *Jude*. Whether *Jude* is the first or next to last computer program on scripture makes little difference. It is here and it is useful.

The program is available on either tape or disk. Except for the standard loading difference, there is no operational change between the tape and disk. I operated both on my 32K CoCo with equal results.

Jude is actually a mini study Bible with all the notes and references available at the touch of a key.

As an assistant pastor of a small church, I have long since known that CoCo was a way we could use the power of the computer in the Lord's work. It is an inexpensive machine with many possibilities for the small church organization or business.

I have already suggested a computer financial report to the pastor and elders—now comes the program *Jude*, and potential for Sunday School and Bible Studies. We have a word for it. Hallelujah!

The program loads well from tape, but pay strict attention to the instructions and only load from a cold start. The program, in both tape and disk versions, will give you an error message and will not run if you fail to observe this precaution.

PRINT MEM on my F revision machine produces 630 bytes as the answer. So every nook and cranny is used for the program and floating "garbage" will mess it up.

Jude is menu driven and the menu is great, but the documentation is slightly lacking. I just sort of blundered into how *Jude* really works.

As you load the program, a billboard appears during the process. After the load is complete, the menu appears and gives you the option of looking at the index.

You can page through the index and get an idea of the abbreviations used and the sources quoted.

After a tour through the directory, you are told to press [ENTER] which launches you through a verse-by-verse presentation of *Jude*. If you press (C) during the presentation you get a commentary. If you press (R) you get references and scriptures to compare. This is where the documentation is not quite as clear as it could be.

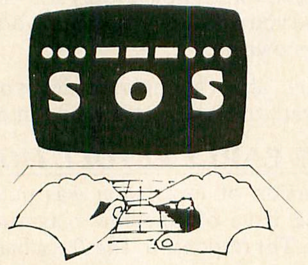
The first time through I was stumped when one commentary had three parts and only two showed up. The next time I pressed (C) a second time and the missing comment appeared. I further found that pressing (R) more than once produced not only a list of referenes, but shows the verses themselves. When you have exhausted the references or commentary, an inverse END tells you to go ahead.

Aside from a couple of spelling errors and a few missing apostrophes, *Jude* is an excellent program for Bible Study. As in all such studies there may be a diverse option on some doctrinal matters, but this is true of the Printed Study Bibles and commentaries too.

Quality Christian Software has the Genesis of a good idea here. The program does everything it says it will. It is surely more than just a game, and it is surely the beginning of a set of tools valuable to any student of the Bible.

(Quality Christian Software, P.O. Box 1899, Duncan, OK 73533, tape $13.99, disk $16.99)

—Howard L. Ball



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Contributions to *the RAINBOW* are welcome from everyone. We like to run a variety of programs which will be useful/helpful/fun for other CoCo owners.

Program submissions must be on tape or disk and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs. All programs should be supported by some editorial commentary, explaining how the program works. We're much more interested in how your submission works and runs than how you developed it. Programs should be learning experiences.

We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a SASE to: Submissions Editor, *the RAINBOW*, P.O. Box 209, Prospect, KY 40059. We will send you some more comprehensive guidelines.

Please do not submit programs or articles currently submitted to another publication.

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Hardware Review

Good Connections With *Video Clear*

For many people, one of the major attractions of the Color Computer is the fact that it uses a normal TV set instead of an (expensive) video monitor. The fact remains, though, that a home TV is better suited to watching Jay North, James Garner and J.J. Jackson than to playing *Jungle Trek*. Even so, when you first got the CoCo home and hooked it up to the big TV in the living room, that "COLOR BASIC OK" looked really good — but then CoCo grew like Topsy, with modems, printers, disk drives and what not, and now tear your hair out when you see all that garbage on the screen. At this point, you can either modify the CoCo for direct video output and get a monitor, or you can do something to clean up the picture on your regular TV set. This alternative is especially attractive if you have a really good TV set that you bought for normal viewing but would like to use with the computer as well.

The *Video Clear* interference rejection cable is intended to be a better way to connect the CoCo (or one of many other home computers, such as the VIC-20, Commodore 64, Timex/Sinclair 1000, Atari 1200XL, etc.) to a TV set. It is basically a ten-foot cable, with phono plugs on each end, which has a filter placed about four inches from the computer end. The kit also includes an adapter to match a phono plug to a 75-ohm (F-type) cable input, and another to match an F-type plug to a 300-ohm twinlead input (this is the type used for cable TV and master antenna systems).

The filter, which is in a red capsule about 1 x 1½ inches, is nothing more than a ferrite toroid core, about 1 inch in diameter, which has the cable wrapped around it eight times. This is not a new trick (as users of some other systems will attest), but it is very useful as it blocks RF garbage that may be on the ground bus of the computer from traveling up the shield of the cable to the TV set. The two adapters are intended to be used in place of the switchbox that comes with the computer; this usually provides a better connection to the TV's antenna input. (The phono plug-to-F jack adapter is itself a useful item; I've used one for some time.)

Most TV sets have the normal pair of screws for a 300-ohm twinlead line; many newer color sets also have a 75-ohm cable input as well. (A few sets — mainly GE and some Japanese brands — have only the 75-ohm input; these are supplied with an adapter for a 300-ohm line. This is also true of every video cassette recorder that I know of.) If you have an F connector on your set, you usually change the switch or jumper on the back of the set to the 75-ohm position, and then screw the phono jack adapter on the F connector. Some TV sets already have a phono jack connector. On these simply plug the cable directly into the set. (A CABLE/-NORMAL switch, if you have one, will not be the switch to change inputs.) If you only have the 300-ohm input, attach the transformer to the terminals and screw the phono-jack adapter onto the transformer. Now you can connect the cable between the computer and the TV; the filter goes near the computer.

I tried the cable on three different brands of computers. While the kit does filter out RFI coming up the cable into the TV and does make a better connection to the set's antenna terminals, no device of this kind can eliminate interference picked up by wiring inside the TV. Many sets have as much as a foot of twinlead between the turner (just behind the channel select knob on the front panel) and the screws on the back cover; this picks up a lot of interference. Newer sets with 75-ohm antenna inputs have a shielded cable between the turner and the input jack — this keeps the noise level way down. One thing to check is that all connections are tight; you may have to squeeze the outer prongs of the phono plugs slightly to get a good fit.

About the only thing wrong with the *Video Clear* is that it doesn't have a switch to select the computer or an antenna. The only way to use both is to change cables manually (which gets rough if your antenna uses 300-ohm twinlead and you have to use a screwdriver each time). You may find that the cable itself clears up the RFI without having to replace the switchbox; or you could use one of the many switchers that are now available for home video systems. You should *never* leave the computer and an antenna connected together without some kind of switch. The signal coming out of the computer can cause all kinds of problems around the neighborhood, and even interfere with navigational devices on aircraft. (For the same reason, feeding the CoCo's signal into an antenna directly is an absolute no-no — unless you like having the FCC kick down your door.)

As I said, the *Video Clear* cable is a very simple and effective way to cut down on RFI. If you have the stuff on hand, you could do the same thing yourself, but if you don't, the *Video Clear* is definitely something to consider, especially if your TV has a 75-ohm input.

(Computer Associates, P.O. Box 283, West Fargo, ND 58078, $14.95)

—Ed Ellers

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```
10 PRINT"EXAMPLE": FORX=ATO M:FORY=STO
P:Z=X + Y:PRINTZ:NEXTY:NEXTX
```

Into this: –

```
10 PRINT "EXAMPLE":
        FOR X = A TO M:
            FOR Y = S TO P:
                Z = X + Y:
                PRINT Z:
            NEXT Y:
        NEXT X
```

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Intbasic's
Faster Than Yours

The author Fenelon once advised, "The more you say, the less people remember." Fenelon's advice was not followed in writing this review. Instead, I chose to follow Socrates' advice, "Employ your time in improving yourself by other men's writings, so that you shall come easily by what others have labored hard for." I hope this review will benefit you. It certainly was hard labor.

If BASIC's inherent slowness causes you consternation and you do not yet have a "handle" on assembly/machine language, your problems may be solved. Meet *Intbasic.* Why not take him out for a "byte" of lunch?

Intbasic comes on a tape with an initialization program and three copies of *Intbasic* which will run on a 16K, 32K, or 64K CoCo (with BASIC or Extended BASIC).

If you have a 16K, you can write 100 program lines and up to 50 *GOTO* or *GOSUB* commands. However, if you have a 32K, you can write 400 program lines and 300 *GOTO* or *GOSUB* commands. You can write 1000 lines of program and up to 1000 *GOTO* or *GOSUB* commands, if you have a 64K.

Intbasic will compile BASIC programs into stand-alone ML programs or ML routines, which can be accessed from a BASIC program. Neat, huh? Also, something I liked, *Intbasic* has *no* tricks employed to make it near impossible to get a backup copy. I don't know why some authors go to such extremes.

Intbasic's only limitations are determined by the size of your CoCo's memory and the instructions available, which are: *FOR, STEP, NEXT, IF, THEN, GOTO(SUB), GOTO, GOSUB, PEEK, POKE, PRINT, PRINT#-2, INPUT, DATA, RESTORE, READ, PMODE, PCOPY, IBSHFT, CLS, REM, DIM , EXEC, RETURN, STOP,* and *END,* and it can do integer operations and string operations.

All the programs I have tried have compiled successfully and run quickly. As the author states in his documentation, some compiled versions are 75 times faster then the BASIC version. Great, as long as your program or subroutine can be written using the instructions listed. The author does tell you how to get around some of *Intbasic's* limited vocabulary and that is a *big* plus.

One thing I should mention, which hasn't limited me but may you, is that you can only use scalar variables (A through Z), and string variables must be *DIMed* (A$(1), B$(4), etc.).

Intbasic's documentation is sketchy. The author, in several instances, tells you what must be done, but doesn't tell you how to do it. Keep in mind, this is only my opinion. After all, I have only been involved with computers for 16 years, the latter nine years teaching them. My main problems were *CSAVEM*ing and relocating. I called Mr. Prey (the author) and asked for help. He assured me my problems could be overcome and sent me a list of questions he had received and the answers. My questions were answered and hopefully yours will be.

I have included a copy of several of those questions at the end of this review. They should answer any questions you have. I believe Mr. Prey should include them in his documentation.

Giving credit where credit is due, the author did a very comprehensive job of covering the instructions and how they must be used. Read that area carefully. Some of the things are very "un"-BASIC. One problem I was having was with READ and DATA instructions. Careful reading revealed a RESTORE must be accomplished before your first READ, and a RESTORE must follow a DATA. Those two tidbits fixed my problem.

What have I done with *Intbasic*? Well, nothing earth-shattering. For the life of me, I haven't come up with any useful ideas yet. Possibly the anxious anticipation is stifling my creativity. I must mention some things which I think shows the power of *Intbasic.* It is a machine language program, very fast, and either goes to screen or to screen and printer. *Intbasic* is fairly user friendly. It only has four prompts (referring to memory) which the user must answer. Are you ready for this: *Intbasic*'s final test was for it to compile itself from its basic form. So *Intbasic* definitely has possibilities.

Just a few improvements could be made. One would be automatic relocations of the subroutines. This should be done *automatically.* Another is the only memory prompt should be where the starting address will be and everything else should be compiled sequentially from there. This would definitely make the program more user friendly, especially when *CSAVEM* time arrives. If you do not have Extended BASIC, you do not have a *CSAVEM* command. To get your compiled version on tape, you would have to write a basic routine which would *PEEK* the locations and *PRINT#-1* out to tape. Loading this program would require yet a second self-generated BASIC program to *INPUT#-1* and *POKE* into the proper locations. Easy enough to accomplish, but why could not *Intbasic* have I/O capabilities to tape?

In summation, I would like to say that *Intbasic* works, but to just take some BASIC program that you have previously written and compile it is near to impossible. It would, for any BASIC program I have, take extensive rewriting and considerable effort, and possibly it couldn't even be done. If you want to speed up a program (or some part) and your program can be written using *Intbasic*'s vocabulary, and you are not having much luck with ML programming then this compiler could be a huge benefit.

Now for those questions and answers I promised:

Q: How can one save a program to tape if the compiler is running under Color BASIC (for those who have Extended BASIC)?

A: A *CSAVEM* command cannot be performed if the compiler is running under Color BASIC. The system should be re-initiated under Extended Color BASIC after the final *CSAVEMable* ML program is produced. The following procedure should be performed if a program is to be *CSAVEMed*:

1. Compile the program under Color BASIC.
2. POKE 113,0:EXEC40999
3. POKE25,6:POKE26,1:NEW
4. *CLEAR* the area to be used by BASIC (ie. the area occupied by the final M.L. program to be *CSAVEMed*2)
5. *CSAVEM* the program.

Q: The user's manual seems to include many hints, useful to machine language programmers, but not very useful to non-machine language oriented users. Such hints as how to relocate the data are not included. Why? Also, in *CLEAR*ing room for the compiler and compiled program, there seems to be some confusion, as this is not explained very well in the Color BASIC Manual. So for "Program 3," what

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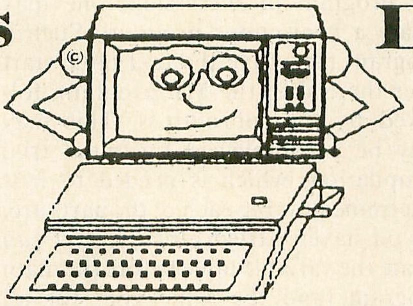

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would be the proper *CLEAR* used?

A: In developing the user's manual, a basic level of programming knowledge is assumed. Certain functions such as *CLEARing* area for machine language programs, relocating data to and from a cassette are not addressed in the manual. We felt that these functions are explained in good enough detail in many articles and such that appear in all four of today's magazines available for the Color Computer, as to exclude the need for explanation in the *Intbasic* 1.0 user's manual.

The proper *CLEAR* command to use in step 4 in order to run "PROGRAM 3" is the following: CLEAR 100,9990.

Q: How am I to produce a *CSAVEMable* program without saving the entire RAM? The sections are to be separated, but who's to know where one is to end and the other is to begin?

A: The final product, as produced by *Intbasic*, is in three parts. By running the program in succession, one may create a continuous program. Such a program may have the text table start after the end of the ML program, followed by the subroutines. This may only be accomplished by initial trial compilation, which is needed to first determine how big each of the parts are. If you haven't tried already, you *can* locate the variable table before the main program (and the same goes for all other parts).

Q: I have not been able to run the compiled program when, as prompted in running the compiler, I enter a different starting location for the subroutine library. What am I doing wrong?

A: The problem seems to be in relocating the subroutines to the location desired. Before running the compiled version, the subroutines must be relocated. The following BASIC program will help in relocating the subroutines:

```
1)PRINT"ENTER START OF AREA
TO BE RELOCATED"
2)INPUTS:PRINT" ","ENDING AT
?":INPUTE
3)PRINT" ","TO BE RELOCATED
STARTING AT"
4) INPUTN:J=0:FOR I=S TO E
5) Z=PEEK(I):Y=N+J:POKEY,Z:J
=J+1:NEXT:END.
```

Q: Can I sell programs that are compiled using *Intbasic*, or do I need some kind of license to do so?

A: You may sell a compiled program, as produced by *Intbasic*, without a license from us, provided we are notified before sales are made.

Q: How much space can I save by compiling my program. What are the variable dimension limitations, if any?

A: *Intbasic* will produce a compiled program, whose size depends on the commands given. Commands like *GOTO* 10000 take 7 bytes of RAM under the interpreter, while the same compiled command will only take three bytes of memory. Variable storage is more efficiently used under *Intbasic*. The maximum allowable variable *DIM*ension for an array in the *Intbasic* is unlimited. Arrays like A(300,100) can fit a 64K machine.

Q: Is my disk system *completely* compatible with *Intbasic*?

A: *Intbasic* 1.0 was designed to run on a non-disk system. An initialization routine, called during execution of *Intbasic* 1.0 and also during execution of any program compiled by *Intbasic*, clears away certain RAM "hooks" created by Extended BASIC and Disk BASIC. This enables operation of the compiler under Color BASIC. On the other hand, one may disable this initialization routine and allow execution of disk commands from within the compiled program (by performing the desired *EXEC*s to the ROM routines is Disk BASIC). The command will disable the routine that initializes lower RAM locations 350 thru 423. This initialization routine is contained in the subroutine section of the final machine language program.

The form of command is: *POKE (SB+509),57* where SB = start of the subroutines. For example, if the subroutines started at 28900, the proper change to eliminate the initialization routine would be a *POKE 29409,57*.

In summary, this will allow one the necessary lower RAM "hooks" needed to run certain Extended or Disk Color BASIC ROM machine language subroutines within programs compiled with *Intbasic*. *Intbasic* can be obtained from:

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—Herbert B. Ridge

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SYSTEMS SOFTWARE

MACRO-80C

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DCBUG is a machine language monitor which allows examining and altering of memory, setting break points, etc.

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— Downloading programs from other computers

The Microtext module is a program pack containing not only firmware but a second serial port so that both your printer and modem can be connected at the same time. Microtext can be configured for any serial printer that will work with the Color Computer, even if it requires line feeds! But even if you don't have a printer, you can keep a permanent copy of your data by storing to cassette tape. Also, any Radio Shack/Centronics-compatible parallel printer may be used by adding the Micro Works' PI80C parallel interface.

For those of you with special terminal applications, Microtext has selectable parity; it sends odd, even, mark or space. With mark parity (which is default) you can send to computers requiring either seven or eight bits. All 128 ASCII codes can be sent. Exchange programs with other Color Computer users! Basic programs may be downloaded from other computers or timesharing systems.

You'll find many uses for this versatile module! Available in ROMPACK, ready-to-use, for **$59.95.**

MACHINE LANGUAGE

MONITOR TAPE: A cassette tape which allows you to directly access memory, I/O and registers with a formatted hex display. Great for machine language programming, debugging and learning. It can also send/receive RS232 at up to 9600 baud, including host system download/upload. 19 commands in all. Relocatable and reentrant. **CBUG Tape Price: $29.95**

MONITOR ROM: The same program as above, supplied in 2716 EPROM. This allows you to use the entire RAM space. And you don't need to re-load the monitor each time you use it. The EPROM plugs into the Extended Basic ROM Socket or the *Romless Pack I*. **CBUG ROM Price: $39.95**

SOURCE GENERATOR: This package is a disassembler which runs on the Color Computer and generates your own source listing of the BASIC interpreter ROM. Also included is a documentation package which gives useful ROM entry points, complete memory map, I/O hardware details and more. A 16K system is required for the use of this cassette. **80C Disassembler Price: $49.95**

GAMES

Star Blaster — Blast your way through an asteroid field in this action-packed Hi-Res graphics game. In ROMPACK; requires 16K. **$39.95**

Pac Attack — Try your hand at this challenging game by Computerware, with graphics, sound and action! Cassette requires 16K. **$24.95**

Haywire — Have fun zapping robots with this Hi-Res game by Mark Data Products. Cassette requires 16K. **$24.95**

Dunkey Munkey — Arcade excitement awaits those who dare to conquer the munkey! Joystick and 32K required, by Intellectronics. Cassette: **$24.95**

Colorpede — Great graphics, two-player option, and pause control in this exciting game by Intracolor Communication. Cassette requires 16K. **$29.95**

Adventure — *Black Sanctum* and *Calixto Island* by Mark Data Products. Each cassette requires 16K. **$19.95** each

Cave Hunter — Experience vivid colors, bizarre sounds and eerie creatures in hot pursuit as you wind your way through a cave maze in search of gold treasures. This exciting Hi-Res game by Mark Data Products requires 16K for cassette version. **$24.95**

Starfire — Fly around the planet defending Earthlings from being snatched up by aliens in this challenging game from Intellectronics. Cassette requires 16K: **$21.95**

Doodle Bug — Joystick-controlled Doodle Bugs must move quickly through mazes while being chased by enemy bugs in Hi-Res game by Computerware. Cassette requires 16K: **$24.95**

Astro Blast — You'll need to act fast as you protect Earth from wave after wave of alien invaders in this Hi-Res game by Mark Data. Cassette requires 16K: **$24.95**

BOOKS

6809 Assembly Language Programming, by Lance Leventhal, **$16.95**

TRS-80 Color Computer Graphics, by Don Inman, **$14.95**

Assembly Language Graphics for the TRS-80 Color Computer, by Don Inman, **$14.95**

Starting Forth, by L. Brodie, **$17.95**

HARDWARE

PARALLEL PRINTER INTERFACE — Serial to parallel converter allows use of all standard parallel printers. PI80C plugs into the serial output port, leaving your Rompack slot free. You supply the printer cable. **PI80C Price: $59.95**

MEMORY UPGRADE KITS: For Rev. level E., ET, NC and TDP-100s, we carry 64K chips; upgrading is easy! Eight prime **64K chips** and instructions: **$64.95**

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EDUCATION NOTES

16K ECB

Avoiding The Avalanche With *Teacher's Aid*

By Steve Blyn
Rainbow Contributing Editor

The school year is well underway. The students have finally settled down to their normal routines. All seems well. What could possibly go wrong at this point? . . . Look out for the avalanche!

If your school system is anything like the ones that I am familiar with, you may very well be beseiged, at this point, with an avalanche of paperwork. It seems that there are more and more reports and forms to fill out each year. Reports that seem to duplicate information for various administrative purposes are ever present. Teachers constantly must refer to the many pupil record cards to fill out this paperwork.

Why can't our computers help us out? They certainly can. There are many fine Database programs that are advertised in *the Rainbow* that are adaptable to classroom needs. If you are interested in any of them, I suggest that you call the company to check whether their product is appropriate to your needs.

Don't be hesitant about telephoning any of the companies that advertise in *the Rainbow*. At Computer Island, we always welcome calls whether they lead to sales or not. These calls keep us more closely in touch with the public and we find out directly what you want and need. Most companies are quite friendly and you will be able to determine beforehand whether you should go through the expense of purchasing their particular product.

This month's program is for those who either cannot spend the money for a professional Data program or for those who will enjoy creating their own simple but adequate teacher's aid program. A teacher will be able to gather the information needed to complete the many required school forms using this program rather than having to filter through many student records with one piece of information here and another there. This program will enable you to customize the types of information that you feel will be needed to help fill out forms or otherwise organize information about your students. The procedures used here could easily be adapted to other areas in the classroom or in the home.

(Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He and his wife, Cheryl, own Computer Island.)

We will first need to decide which categories or variables we will include for each student. This program illustrates eight variables. They are named A$, B$, C$ . . . to H$ and represent each child's name, date of birth (D.O.B.), address, phone number, most recent math score, most recent reading score, weight and height. You may, of course, have different variables or a different amount of them.

The computer is alerted to these variables on Line 30. I have *DIMensioned* them to 30 as a typical class size. Use your own *DIM* numbers for your total class register. You can always use a higher *DIM* size. Line 80 will tell the computer to stop reading *DATA* statements when it encounters an A$ using the word "END" instead of a student's name.

A professionally purchased program will, of course, create *DATA* files. This program instead has the information entered in *DATA* lines. One *DATA* line is entered for each student. This method easily gives us an edge in future alphabetizing of the students. No routine is needed as the students' names can easily be entered from the attendance book which is no doubt already in alphabetical order. The last *DATA* line that you enter should have the word "END" as the student's name.

A short menu is included to better help you use this program. You may choose whether: 1) you want to see all of the students' records one at a time in order, or 2) just see one certain student's records, or 3) end the program. By changing the *PRINT* statements to *PRINT#-2*, you may use a printer to get hard copy of these records if the need ever arises.

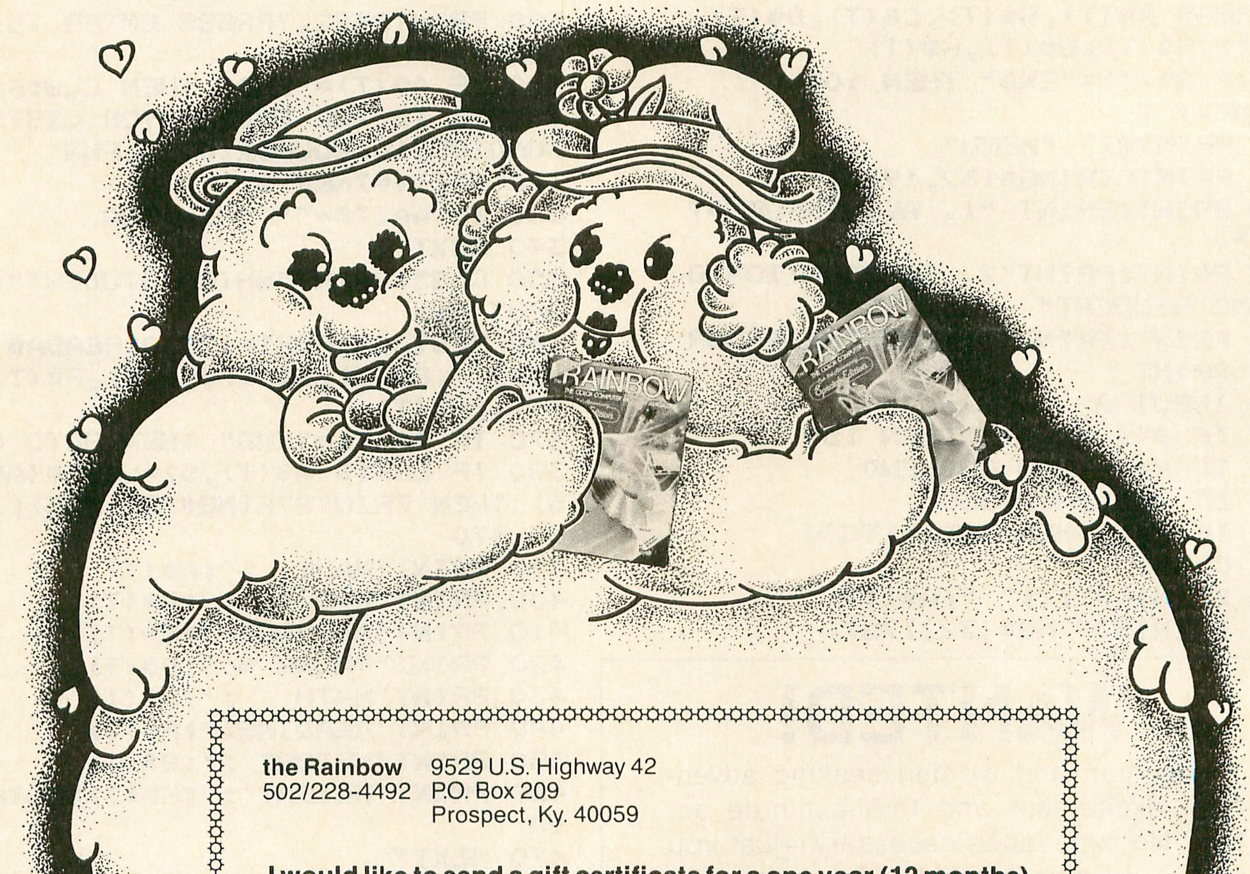
We hope that this program can help you to get out from under the avalanche of paperwork that most teachers experience. Please feel free to alter the program in any way to meet your individual class' needs, or to use it for any non-school application (Little Leagues, scout groups).

```
220.... 021A
410.....0433
END... 06CE
```

The listing:

```
10 REM"TEACHER'S AIDE"
20 REM"STEVE BLYN,COMPUTER ISLAN
```

It'sno job to give the perfect gift for this Christmas.



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```
D,NY,1983
30 DIMA$(30),B$(30),C$(30),D$(30
),E$(30),F$(30),G$(30),H$(30)
40 CLS:PRINT"    THE NAME OF YOU
R CLASS"
50 PRINTSTRING$(32,175);
60 FOR T= 1TO 30
70 READ A$(T),B$(T),C$(T),D$(T),
E$(T),F$(T),G$(T),H$(T)
80 IF A$(T)="END" THEN 100
90 NEXT T
100 PRINT@77,"MENU"
110 PRINTSTRING$(32,191);
120 PRINT:PRINT "1. ALL INFORMAT
ION"
130 PRINT:PRINT"2. INFORMATION O
N ONE STUDENT"
140 PRINT:PRINT"3. END THE PROGR
AM":PRINT
150 INPUT A
160 IF A<1 OR A>3 THEN 150
170 IF A=3 THEN CLS:END
180 IF A=2 THEN 350
190 IF A=1 THEN FORT=1TO30
200 CLS5
210 PRINT"#";T;" ";A$(T)
220 PRINTSTRING$(32,175);
230 PRINT"D.O.B.  :";B$(T)
240 PRINT"ADDRESS:";C$(T)
250 PRINT"PHONE #:";D$(T)
260 PRINT"MATH    :";E$(T)
270 PRINT"READING:";F$(T)
280 PRINT"WEIGHT  :";G$(T)
290 PRINT"HEIGHT  :";H$(T)
300 PRINT@422,"PRESS ENTER TO GO
 ON";
310 IF A$(T)="END" THEN CLS:PRIN
T"THIS IS THE END OF YOR LIST":S
OUND180,10:SOUND210,10:RUN
320 WAIT$=INKEY$
330 IF WAIT$="" THEN 320
340 NEXT T
350 CLS5:PRINT"WHICH STUDENT";:I
NPUT AN$
360 RESTORE:FORT=1TO30:READA$(T)
,B$(T),C$(T),D$(T),E$(T),F$(T),G
$(T),H$(T)
370 IF A$(T)="END" THEN GOTO 480
380 IF LEFT$(A$(T),5)=LEFT$(AN$,
5) THEN PRINTSTRING$(32,255); EL
SE 470
390 PRINT"NAME   :";A$(T)
400 PRINT"D.O.B.  :";B$(T)
410 PRINT"ADDRESS:";C$(T)
420 PRINT"PHONE #:";D$(T)
430 PRINT"MATH    :";E$(T)
440 PRINT"READING:";F$(T)
450 PRINT"WEIGHT  :";G$(T)
460 PRINT"HEIGHT  :";H$(T):GOTO 4
90
470 NEXTT
480 PRINT@352," STUDENT NOT FOUN
D ON THIS LIST"
490 PRINT@418," PRESS nEXT OR mE
NU OR eND";
500 WAIT$=INKEY$
510 IF WAIT$="M" THEN RUN
520 IF WAIT$="N" THEN 350
530 IF WAIT$="E" THEN CLS:END
540 GOTO 490
550 DATA CLAUS SANTA,1/1/01,1 NO
RTH POLE AVENUE,999-1234,10.7,12
.8,300,5'8"
560 DATA CLEAR CHRIS,8/3/71,75 T
HIRD STREET,856-2640,5.8,7.6,108
,5'2"
570 DATA COMPUTER CHIP,10/10/70,
1 TANDY CENTER,765-4321,7.2,6.8,
150,5'9"
580 DATA KEYBOARD KARL,4/5/71,13
5 TYPEWRITER LANE,456-4567,6.7,8
.7,138,5'4"
590 DATA ROMPACK RANDY,12/18/70,
245 DISK DRIVE,234-5678,5.8,7.6,
128,5'3"
600 DATA END,,,,,,,
```

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COLOR COMPUTER MEMORY MAP

By BOB RUSSELL

This is the final installment in a comprehensive series of references on the Color Computer memory. First of all, I would like to thank all of you who offered compliments and suggestions. Your encouragement has been a primary motivational factor in continuing to update this map.

Next, what follows are the additional discoveries I have made during the last six months. Also included are corrections to any errors I made in version 1.0.

The complete version 2.0, however, will have its pages renumbered. Version 2.0 of the Memory Map will be available about the same time you read this article. It looks like the map will exceed 60 pages; it is 60 pages long at the time of this writing. The new version also contains many spelling corrections and a rewrite of some previous descriptions to try and clarify their functional descriptions. These changes *are not* included in this magazine version to save space.

Now for a few additional technical comments. Note that another reference has been added. I have begun to document changes between BASIC 1.2 and 1.1. Also, I have begun to document changes between Extended BASIC 1.1 and 1.0. Maybe I will find time in the next few months to improve the description of these changes also. I am not really sure what I am going to do with the new Disk BASIC because things have shifted so much. What are your suggestions?

If you prefer not to cut up your Rainbow *Magazine, you may purchase copies of Memory Map Version 2.0 in its entirety, enclosed in an attractive cover for $12 (American) postpaid. (Thanks for all the previous foreign orders, but the exchange rate has been bothersome to my small town bank.) Wisconsin residents should add 5% for sales tax. I also invite dealer and computer club volume purchases at discounted prices. For inquiries or placing orders, write: Bob Russell, N5474 Stillwater Court, Fredonia, WI 53021. Note the price had to go up to cover additional printing and mailing costs.*

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Sources referred to in this map:

1) *Getting Started With Color* BASIC
   Copyright 1981 Tandy Corp.
   Fort Worth,TX 76102

2) *Going Ahead With Extended* BASIC
   Copyright 1981 Tandy Corp.
   Fort Worth, TX 76102

3) *Service Manual, TRS-80 Color Computer*
   Catalog Number 26-3001/3002

4) *TRS-80 Microcomputer News*
   (for TRS-80 users)
   P.O. Box 2910
   Fort Worth, TX 76113-2910

5) *Color Computer News*
   REMarkable Software
   P.O. Box 1192
   Muskegan, MI 49443

6) *the Rainbow*
   9529 U.S. Highway 42
   P.O. Box 209
   Prospect, KY 40059

7) *80 Micro*
   80 Pine Street
   Peterborough, NH 03458

8) *Hot CoCo*
   P.O. Box 975
   Farmingdale, NY 11737

```
 Beginning  Ending
 DEC   HEX  DEC   HEX
 ADDR  ADDR ADDR  ADDR                           Description
 ----- ---- ----- ----    ----------------------------------------------
00000 0000 32767 7FFF     RAM

00000 0000 01023 03FF     System Use

   00006 0006                String flag indicating variable type.
                             $00 = number
                             $FF = string

   00007 0007                Garbage Collection Flag
                             $00 = not occured
                             $FF = occured

   00008 0008                Array assignment Flag
                             $00 = assignment ok
                             $FF = assignment not allowed
                             Cleared from $AD43

   00011 000B 00012 000C     Address of next available string descripter
                             reset at $AD33

   00041 0029 00042 002A     Continue line number displayed by execution of
                             "STOP"

   00043 002B 00044 002C     Temporary 2 byte storage area

   00045 002D 00046 002E     Address of position to return to after
                             execution of CONT.

   00047 002F 00048 0030     Address of current Basic program line the
                             interpreter is executing.

   00049 0031 00050 0032     Current Data statement line number (after read)

   00051 0033 00052 0034     Pointer  to comma after last data value read

   00055 0037 00056 0038     Name of last variable used

  00104 0068 00105 0069    Current line number being interpreted. Will
                           contain $FFFF if illegal line number or if in
                           command mode

  00106 006A 00111 006F    Parameters set by definition of the output
                           device.

      00106 006A               Comma field width (defaults to 16)

      00107 006B               Tab field width (defaults to 16)

      00109 006D               Number of characters in output line (if
                               Device is set to 0 for screen this value
                               is set to 32

      00110 006E               Output device number

  00112 0070               Input Buffer status flag
                              0=unpurged (something left)
                            FF=purged (empty)
```

```
Beginning  Ending
DEC   HEX  DEC   HEX
ADDR  ADDR ADDR  ADDR                       Description
----- ---- ----- ----     -----------------------------------------------
00000 0000 32767 7FFF    RAM Cont.

 00000 0000 01023 03FF     System Use Cont.

   00120 0078                File mode set by OPEN or CLOSE statements
                                0 = closed
                                1 = open for input
                                2 = open for output

   00121 0079                Dynamic changing count of characters remaining
                             in the cassette Block as bytes are moved from
                             the block to the Input/Output Buffer.

   00122 007A 00123 007B     Address of the Input/Output Buffer.

   00129 0081                CSRERR[2]
                             1 = Checksum Error (Tape Error)
                             2 = Memory Error (load error)

   00135 0087                Last key pressed (character obtained by INKEY$)

   00144 0090                Upper allowable pulse width limit. Default =
                             $18 for cassette input.

   00145 0091                Lower allowable pulse width limit. Default =
                             $0A for cassette input.

   00175 00AF                Trace Flag
                              0 = TRON
                             76 = TROFF

   00176 00B0 00177 00B1     Address of start of DEFUSR table. $013E

 00189 00BD 00202 00CA     Line Data

   00189 00BD 00190 00BE     X1 line starting X coordinate.
   00191 00BF 00192 00C0     Y1 line starting Y coordinate.

   00193 00C1                Current CSS mask for control of PIA
                             register bits at $FF22. Value is either
                             0 or 8.

   00194 00C2                Value is either 1 (indicating PSET or 0
                             indicating PRESET).

   00195 00C3 00196 00C4     X2 line ending X coordinate.
   00197 00C5 00198 00C6     Y2 line ending Y coordinate.

   00199 00C7 00200 00C8     Previous line ending X coordinate.
   00201 00C9 00202 00CA     Previous line ending Y coordinate.

 00203 00CB 00218 00DA     Circle data

   00203 00CB 00204 00CC     Center X coordinate.
   00205 00CD 00206 00CE     Center Y coordinate.

   00207 00CF 00208 00D0     Radius
```

```
   00209 00D1 00210 00D2     H/W ratio

   00217 00D9 00218 00DA     End point of a circle section

 00219 00DB                Pixel Change flag

00222 00DE 00229 00E5    PLAY command data/constants

 00222 00DE                Octave. "O" parameter-1. Default
                           value is 2 or "O3".

 00223 00DF 00224 00E0     Volume. "Vn" parameter.

   00223 00DF                MSB of "V" (126+n*4). Default value is
                             186 or V15 (186=126+15*4)
   00224 00E0                LSB of "V" (126-n*4). Default value is
                             66 or V15 (126-15*4).

 00225 00E1                 Note length "L". Default value is 4 or L4

 00226 00E2                 Tempo "T". Default value is 2 or T2. Must
                            be value 0-255

 00227 00E3                 Number of Dots after note length. Default
                            value is 0.

 00281 0119 00282 0120     Address of next file buffer that could be
                           allocated

 00282 011A                Keyboard alpha lock (upper or lower case
                           selection) [1]
                           0 = not locked (lower case)
                           255 = locked (upper case)

 00318 013E 00337 0151     DEFUSR Table. Definition of entry point for
                              USR functions 0-9
   00318 013E 00319 013F      Address of DEFUSR 0
   00320 0140 00321 0141      Address of DEFUSR 1
   00322 0142 00323 0143      Address of DEFUSR 2
   00324 0144 00325 0145      Address of DEFUSR 3
   00326 0146 00327 0147      Address of DEFUSR 4
   00328 0148 00329 0149      Address of DEFUSR 5
   00330 014A 00331 014B      Address of DEFUSR 6
   00332 014C 00333 014D      Address of DEFUSR 7
   00334 014E 00335 014F      Address of DEFUSR 8
   00336 0150 00337 0151      Address of DEFUSR 9

 00338 0152 00345 0159     Keyboard rollover table [4] Oct 1981

                              Bit 7   6   5   4   3   2   1   0
   00338 0152                       ENTER 8   0   X   P   H   @
   00339 0153                       CLEAR 9   1   Y   Q   I   A
   00340 0154                       BREAK :   2   Z   R   J   B
   00341 0155                             ;   3   ~   S   K   C ~= UP ARROW
   00342 0156                             ,   4   ~   T   L   D ~= DN ARROW
   00343 0157                             -   5   ~   U   M   E ~= LT ARROW
   00344 0158                             .   6   ~   V   N   F ~= RT ARROW
   00345 0159                       SHIFT /   7   ~   W   O   G ~= BLANK
                  Dec val of contents  191 223 239 247 251 253 254
                  of 338-345 if key in
                  col. is pressed
 Beginning  Ending
 DEC   HEX  DEC   HEX
 ADDR  ADDR ADDR  ADDR                        Description
 ----- ---- ----- ----   ------------------------------------------------
00000 0000 32767 7FFF   RAM Cont.

  00000 0000 01023 03FF    System Use Cont.

  00362 016A 00364 016C    Hook to keyboard input. Set to $7E8CF1 by
                           initialization of Extended Basic. Comes
                           here before input.

  00368 0170 00370 0172    Hook to Make sure that a device is open for
                           output.

  00416 01A0 00418 01A2    Hook to allow Get and Put routines to access
                           disk records. Called from $8162,$8AFA,$975C,
                           $A910, and $C29A. Set to $7EC29A (JMP $C29A).

  00419 01A3 00421 01A5    Hook for Extended Basic interpreter
                           tokenization Called from $B821. Set to
                           $7E8304 (JMP $8304) by initialization of
                           Extended Basic.

  00422 01A6 00424 01A8    Hook for Extended Basic interpreter
                           untokenize. Called from $B7C2.

  00465 01D1 00488 01E6    File I/O data

      00474 01DA 00481 01E1      Filename found

      00482 01E2                 File Type
                                 0 = Tokenized Basic
                                 1 = Data
                                 2 = Binary

       00483 01E3 00484 01E4     File descripter block

         00483 01E3               0 = Data

         00484 01E4               0 = Tokenized Basic or assembly language
                                 <>0 = Ascii

       00487 01E7 00488 01E8     Start address or load address of an
                                 assembly language program

01536 0600 06350 18CE   Disk buffers,variable storage, and DOS variable
                        storage (NOTE CONFLICT WITH GRAPHICS PAGES 1 - 4)
                        Buffer space normally defaults to 256 bytes at
                        startup but may be changed using the FILES command.
                        File control blocks (FCB's) default to 843 bytes
                        total at startup but can also be reset by the FILES
                        command. Req. FCB bytes = (FILES+1)*281.
                        Ref. [5] #9;[6] July 83 pp71-80

  01536 0600 01791 06FF    Disk buffer for Disk I/O - 1 sector long - 256
                           bytes are reserved at startup but may be changed
                           using FILES command.
```

```
  01792 0700 02047 07FF    Disk buffer for Disk I/O - 1 sector long - 256
                           bytes are reserved at startup but may be changed
                           using FILES command.

  02344 0928               Address of start of buffer table

  02380 094C               Disk filename storage area
  02391 0957 02392 0958    File type
                              $0000 Basic Program
                              $00FF Basic Program ASCII format
                              $0100 Binary Data
                              $01FF ASCII Data
                              $0200 Machine language program
                              $0300 Binary Text
                              $03FF ASCII Text

  02394 095A               Current Default drive number

  02395 095B               Number of user allocated file buffers

  02396 095C               Non 0 while doing DISKINI or BACKUP

  02397 095D               Non 0 while doing LOAD

01536 0600 06350 18CE   Disk buffers,variable storage, and DOS variable
                        storage (NOTE CONFLICT WITH GRAPHICS PAGES 1 - 4)
                        Buffer space normally defaults to 256 bytes at
                        startup but may be changed using the FILES command.
                        File control blocks (FCB's) default to 843 bytes
                        total at startup but can also be reset by the FILES
                        command. Req. FCB bytes = (FILES+1)*281.
                        Ref. [5] #9;[6] July 83 pp71-80

     02459 0987                Verify Status
                                  1 for on
                                  0 for off

  02978 0BA2 06350 18CE    Disk Buffers. For every file opened Disk
                              BASIC allocates a 281 byte buffer.

     02978 0BA2 03259 0CBB      1 file open.
     03260 0CBC 03540 0DD4      2 files open.
     03541 0DD5 03821 0EED      3 files open.
     03822 0EEF 04102 1006      4 files open.
     04103 1007 04383 111F      5 files open.
     04384 1120 04664 1238      6 files open.
     04665 1239 04945 1351      7 files open.
     04946 1352 05226 146A      8 files open.
     05227 146B 05507 1583      9 files open.
     05508 1584 05788 169C     10 files open.
     05789 169D 06069 17B5     11 files open.
     06070 17B6 06350 18CE     12 files open.

 Beginning  Ending
 DEC   HEX  DEC   HEX
 ADDR  ADDR ADDR  ADDR                        Description
 ----- ---- ----- ----   ------------------------------------------------
32768 8000 40959 9FFF   EXTENDED BASIC ROM [1]

     33467 82DE 33521 82F1      *S* Trace Routine Ref.[8]
```

```
   35056 88FD 35080 8908    *S* Extended BASIC's error processing routines
                                Ref. [5] #21 p126-127

   35083 890B               Extended BASIC's error code table.

   35386 8A3A               *S* Entry to RENUM when all parameters are set

   38316 95AC               *S* Returns normal text screen from graphics


  Beginning  Ending
  DEC   HEX  DEC   HEX
  ADDR  ADDR ADDR  ADDR                     Description
  ----- ---- ----- ----    ------------------------------------------
40960 A000 49151 BFFF    BASIC ROM[1]

   40974 A00E 41326 A170    Re-start routines. Ref.[5]#22

   40974 A00E 40998 A026    *S* Secondary restart routine enables the
                            cartridge interupt then determines whether cold
                            or warm start is specified. A warm start is
                            performed if the restart flag at $71 contains
                            $55 and if the the value of the byte pointed to
                            by the address at $72-73 is $12(NOP).

   40999 A027 41069 A06D    *S* Primary restart routine. Performs reset when
                            reset button is pressed. PIA and SAM are
                            reinitialized and then a jump to the secondary
                            reset routine $A00E is executed.
                            Function of reset button can be emulated in
                            software by POKE 113,0:EXEC 40999

   41076 A074 41191 A0E7    *S*Cold start routine

      41076 A074 41125 A0A5    Initializes low Ram Scratch pad memory
                               $0000-$3FFF, determines upper limit of RAM
                               and stores this limit at $74-$75, does
                               equivalent of CLEAR 200, and sets up BASIC's
                               next line pointer.

      41126 A0A6               Check for extended Disk ROM  and branch;
                               Basic ends up here after Extended Basic
                               initializes and reconfigures the system to
                               include Extended Basic functions. Then a
                               check is made to see if Disk Basic ROM is
                               present; if $C000 contains $44 and $C001
                               contains $4B then jump is made to $C002

      41163 A0CB               Check for extended Basic ROM  and branch;
                               a check is made to see if Extended Basic ROM
                               is present; if $8000 contains $45 and $8001
                               contains $58 then jump is made to $8002.

      41175 A0D7               *S* Displays version of BASIC ROM  $A000-
                               $BFFF.

      41181 A0DD 41191 A0E7    *S* set restart vector and flag for warm re-
                               start go to main command mode idle loop


   41192 A0E8               *S* Warm restart (pointers not reinitialized)
```

```
41203 A0F3                 *S* Return to BASIC

41206 A0F6                 *S* Default FIRQ handler

41224 A108                 *S* Cartridge secondary restart routine

40974 A00E 41328 A170      Re-start routines. Cont. Ref.[5]#22pp98-102

   41229 A10D 41256 A128      BASIC Initialization data down loaded to Ram
                              addresses $008F-$00AA.

   41257 A129 41286 A145      BASIC Initialization data down loaded to RAM
                              addresses $010C-$0129

   41286 A146 41328 A170      Copyright notice Logo text

41334 A176                 *S* Get character from device specified by $6F and
                               put that character into REG. A. no modification

41393 A1B1 41410 A1C0      *S* Display cursor and wait for input character
                               from keyboard and put character into REG. A.

41409 A1C1 41414 A1C6      *S* Check for character at keyboard and flag status
                               (8 bit =0 if character is not there; 8 bit =1
                               if character is there). Ref. [5] Vol 1 #3

41416 A1C8 41452 A1EC      *S* Check for character at keyboard and decode
                               character. (called from $A1C3)

41453 A1ED 41516 A22C      *S* Decode character input from keyboard. (called
                               from $A1E1)

41517 A22D 41527 A237      *S* check for shift key depressed. (Called from
                               $A203)

41528 A238 41581 A26D      Check keyboard (called from $A21B)

41582 A26E 41601 A281      Keyboard Special character table
  41582 A26E                 $5E (Up Arrow)
  41583 A26F                 $5F (Shift Up Arrow)
  41584 A270                 $0A (Down Arrow)
  41585 A271                 $5B (Shift Down Arrow)
  41586 A272                 $08 (Left Arrow)
  41587 A273                 $15 (Shift Left Arrow)
  41588 A274                 $09 (Right Arrow)
  41589 A275                 $5D (Shift Right Arrow)
  41590 A276                 $20 (Space)
  41591 A277                 $20 (Space)
  41592 A278                 $30 (Zero)
  41593 A279                 $12 (Shift Zero)
  41594 A27A                 $0D (Enter)
  41595 A27B                 $0D (Shift Enter)
  41596 A27C                 $0C (Clear)
  41597 A27D                 $5C (Shift Clear)
  41598 A27E                 $03 (Break)
  41499 A27F                 $03 (Shift Break)
  41500 A280                 $40 (@)
  41501 A281                 $13 (Shift @)

41602 A282 41639 A2A7      *S* Character output routine determines current
                               output device specified by $6F, then outputs
                               the character in reg A to that device.
```

```
Beginning  Ending
 DEC   HEX  DEC   HEX
 ADDR  ADDR ADDR  ADDR                       Description
 ----- ---- ----- ----      -------------------------------------------
40960 A000 49151 BFFF      BASIC ROM[1] Cont.

41640 A2A8 41662 A2BE      Set parameters $79-$7E and perform cassette output

41606 A2BF 41722 A2FA      *S* Send character in REG. A. to current output
                               device. Called as subroutine from $A282.
                               Ref. [5] Vol 1 #4 and [6] Vol 2 #8 p122-123

41723 A2FB 41737 A309      *S* Send bit (called from $A2DD)

   41730 A302                  *S* Delay half bit time

41738 A30A 41822 A35E      *S* Screen Display routine. Ref.[6] April 83 p50

41823 A35F 41859 A383      *S* Routine to set output parameters for selected
                               device in RAM memory $6A to $6F

41860 A384 41868 A38C      *S* Routine to set up parameters for cassette
                               output

41869 A38D 41964 A3EC      *S* Subroutine clears sceen then does line input to
                               buffer.

   41872 A390                  *S* Line input entry point (no clear screen)

41965 A3ED 41989 A405      *S* Routine to assure proper file mode is set and
                               file has properly been opened

41990 A406 42005 A415      *S* Routine to assure when device is set for
                               cassette output that a file is open for output
                               and the mode is correct

42006 A416 42044 A43C      *S* Execution of "CLOSE" BASIC command (Token $9A)

42045 A43D 42059 A44B      *S* Assure any remaining characters in the output
                               buffer are purged from the buffer and written
                               to the output device (called by Close from
                               $A43B)

42060 A44C 42135 A497      *S* Execution of "CSAVE" BASIC command (Token $98)

42136 A498 42237 A4FD      *S* Execution of "CLOAD" BASIC command (Token $97)

   42232 A4F6                  *S* Display of "I/O Error"

42238 A4FE 42301 A53D      *S* Execution of "CLOADM" Called by CLOAD Command
                               from $A49C

42302 A53E 42323 A553      *S* Execution of "EXEC" BASIC command (Token $A2)

42324 A554 42339 A563      Position cursor for PRINT@

42340 A564 42359 A577      *S* Execution of "INKEY$" BASIC function (Token
                               $FF92)
42360 A578 42401 A5A1      *S* Parse out filename from current position in
                               input buffer. Used in conjunction with search
                               for filename routine at $A648
```

```
 42394 A59A 42401 A5A1      *S* Transfer block X register holds starting
                               address, B register holds number of bytes to
                               move, U holds destination address.

42402 A5A2 42436 A5C4      *S* Parse out device number

42437 A5C5 42445 A5CD      *S* Parse out filename called by CLOAD from $A4A0
                              and by SKIPF from $A5EC

42446 A5CE 42475 A5EB      *S* Execution of "EOF" Basic function (Token $FF8C)

42476 A5EC 42485 A5F5      *S* Execution of "SKIPF" command (Token $A3)

42486 A5F6 42531 A623      *S* Execution of "OPEN" command (Token $99)

42532 A624 42567 A647      *S* Open a tape file for input

   42549 A635                  *S* Read an ASCII file from tape

42568 A648 42583 A657      *S* Search tape for a filename

42584 A658 42624 A680      *S* Open a tape file for output

42625 A681 42762 A70A      *S* Find a file  specified by filename $1D2 - $1D9

   42750 A6FE 42762 A70A       *S* Blink Corner of the screen

42825 A749 42836 A754      *S* Read one byte

42837 A755 42844 A75C      *S* Read one bit

42845 A75D 42859 A76B      Determine wavelength of cassette input

42860 A76C 42875 A77B      Time cassette input by watching for 0 crossover

42876 A77C 42902 A796      *S* Turn on tape motor synchronize data (read
                               gap/$55's); U and Y are preserved; FIRQ and IRQ
                               are masked

   42903 A797 42924 A7AC       Calculate Time Till next falling edge. Called
                               from $A786

   42925 A7AD 42937 A7B9       Check that pulse width is between allowable
                               limits. Called from $A784

   42938 A7BA 42940 A7BC       Clear pulse counter. Called from $A7B5.

42941 A7BD 42967 A7D7      *S* Execution of "MOTOR" command (Token $9F)

   42954 A7CA                  *S* Turn on tape motor

   42961 A7D1 42967 A7D7       *S* 500 millisecond delay

      42963 A7D3 42967 A7D7 *S* Entry point to the delay routine where you

                                   can set the delay by the magnitude of a
                                   value you pass in the X register. An RTS
                                   will be processed when countdown to 0 is
                                   reached.

42968 A7D8 42980 A7E4      *S* Turn on tape motor and write leader/gap/$55's
```

```
42981 A7E5 42995 A7F3    *S* Write one record to tape with motor control

  42985 A7E9 42995 A7F3    *S* Turn off tape motor

42996 A7F4 43046 A826    *S* Write Block; tape should be up to speed and
                             leader of $55's already written in 1st block;
                             $7E contains the buffer address; $7C contains
                             the block type; $7D contains number of data
                             bytes in block; X= buffer address + number of
                             data bytes; all registers modified

43050 A82A               *S* Write one byte. Called by Write Block Routine
                             from $A80F,$A813,$A817,$A81E
   43100 A85C                Sine table for CSAVE.
                               Hex     Decimal
      43100 A85C               $82       130
      43101 A85D               $92       146
      43102 A85E               $AA       170
      43103 A85F               $BA       186
      43104 A860               $CA       202
      43105 A861               $DA       218
      43106 A862               $EA       234
      43107 A863               $F2       242
      43108 A864               $FA       250
      43109 A865               $FA       250
      43110 A866               $FA       250
      43111 A867               $F2       242
      43112 A868               $EA       234
      43113 A869               $DA       218
      43114 A86A               $CA       202
      43115 A86B               $BA       186
      43116 A86C               $AA       170
      43117 A86D               $92       146
      43118 A86E               $7A       122
      43119 A86F               $6A       106
      43120 A870               $52        82
      43121 A871               $42        66
      43122 A872               $32        50
      43123 A873               $22        34
      43124 A874               $12        18
      43125 A875               $0A        10
      43126 A876               $02         2
      43127 A877               $02         2
      43128 A878               $02         2
      43129 A879               $0A        10
      43130 A87A               $12        18
      43131 A87B               $22        10
      43132 A87C               $32        50
      43133 A87D               $42        66
      43134 A87E               $52        82

  43951 ABAF             BASIC Error Code Table

  44001 ABE1 44007 ABE7 ASCII text 'ERROR'

  44008 ABE8 44011 ABEB ASCII text 'IN'

44064 AC20               *S* Routine to move a block of memory; $41-$42
                             holds destination top address; $43-$44 holds
                             source top address; $45-$46 holds destination
                             bottom address; $47-$48 holds source bottom
                             address.

44102 AC46 44146 AC72    *S* Error Processing routine. Ref. [5] #21 p126-127
```

```
44036 AC37               *S* Check if room under stack.

44156 AC7C               *S* Tokenize ASCII inputs

44271 ACEF               *S* Execution of a routine that relinks line link
                             pointers (The first 2 bytes in a line point
                             to the address of the start of the next line.)

   44321 AD21               *S* Execution from this point clears all
                                variables and moves the stack

   44326 AD26               *S* Execution from this point clears variables
                                only

44516 ADE4 44522 ADEA *S* Execution of "RESTORE" BASIC command
                          (Token $8F) Ref. [5] #21 p 126-127

44539 ADFB               *S* Exec 44539 has performs equivalent of :
                             1 A$=INKEY$:IFA$=""THEN1

44903 AF67                *S* Get next line number and place it in temporary
                              scratch area $2B-2C

45677 B26D                Check for "," syntax

45679 B26F                Check for "A" syntax

46052 B3E4                Put cursor position in D register (called by
                          PRINT@ routine from $B3E4

46154 B44A                *S* Display of "FC ERROR" message.

46859 B70B                *S* Execution of routine to evaluate argument of
                              PCLEAR command. Argument should be present in B
                              register.

46909 B73D                Determine offset load value for CLOADM command

49152 C000 65279 FEEF   Cartridge ROM[1]/ Disk Operating System (DOS ends at
                          $D800)

  49665 C201 49683 C213    Disk BASIC Function keyword - token table - ASCII
                           Characters

                           CONTAINS   CONVERTED TO TOKEN
                           STRING       HEX  DEC(MSB) DEC(LSB)
      49665 C201 49667 C203  CVN        $FFA2   255       162
      49668 C204 49671 C207  FREE       $FFA3   255       163
      49672 C208 49674 C20A  LOC        $FFA4   255       164
      49675 C20B 49677 C20D  LOF        $FFA5   255       165
      49678 C20E 49681 C211  MKN$       $FFA6   255       166
      49682 C212 49683 C213  AS         $FFA7   255       167
                           (Note that AS is tokenized but is not in the
                            table of pointers $C214-C21D.

  49684 C214 49693 C21D    Table of Pointers to subroutine entry addresses
                           associated with Disk BASIC Function Keyword Table
                           defined at $C201 to $C213

                         Contents  For Function
      49684 C214           $CD1A     CVN
      49686 C216           $CDC0     FREE
      49688 C218           $CD36     LOC
      49690 C21A           $CD5B     LOF
      49692 C21C           $CD28     MKN$
```

49741	C24D	49783	C277	*S* Disk BASIC's error processing routine. Ref.[5] #21 p127-128
49784	C278			Disk BASIC's error code table.

Beginning DEC ADDR	HEX ADDR	Ending DEC ADDR	HEX ADDR	Description
49152	C000	65279	FEEF	Cartridge ROM[1]/ Disk Operating System (DOS ends at $D800)
50280	C468			*S* OPEN file subroutine. Before calling this routine the filename should be processed by the routine at $C8A4, the A reg should contain the file mode ($49=ASCII "I" for input or $4F=ASCII "O" for output), the B reg should contain the device number. Also $957-958 should contain the file type.
50882	C6C2			*S* Execution of "KILL" Disk BASIC command (Token $D2)
50885	C6C5			*S* Entry point for KILL when you have set the filename you want to kill by executing the routine at C84A.
51364	C8A4			*S* Subroutine to process a filename. Prior to calling this routine $EB should be set with the default drive number, and $957 should contain the filename.
51771	CA3B			*S* performs close of a disk file
51795	CA53			*S* entry point for close when Device # at $6F is set.
52876	CE8C			*S* Execution of "SAVEM" Disk BASIC command (tokenized to $D84D Note $4D is the letter "M")
52965	CEE5			*S* Execution of "LOADM" Disk BASIC command (tokenized to $D34D Note $4D is the letter "M")
53733	D1E5	53774	D20E	*S* Cleanup after BACKUP, DSKINI, or LOAD command Ref. [5] #21 p126-127

Beginning DEC ADDR	HEX ADDR	Ending DEC ADDR	HEX ADDR	Description
65280	FF00	65535	FFFF	INPUT/OUTPUT AREA[3]
65376	FF60	65378	FF62	Control registers for special I/O (used for Radio Shack Digitizer 26-1195
65376	FF60			X coordinate 0-255
65377	FF61			Y coordinate 0-191
65378	FF62			Pen Status Bit 0 = Pen down Bit 1 = Proximity (pen is within writing range of digitizer Bit 2 = X margin Bit 3 = Y margin

Beginning DEC ADDR	HEX ADDR	Ending DEC ADDR	HEX ADDR	Description
65280	FF00	65535	FFFF	INPUT/OUTPUT AREA[3]
				Map of areas that have changed between Basic 1.2 and 1.1
40961	A001			New start address for keyboard poll routine - POLCAT
41236	A114			Change to Basic initialization value of default baud rate.
41301	A155			Change to copyright notice to replace 0 in 1.0 by 1 to obtain 1.1
41310	A15E			Change to year of copyright notice from 0 in 1980 to 3 in 1983.
41398	A1B6			New address for keyboard strobe routine.
41409	A1C1	41490	A212	Changes to POLCAT
41494	A216			"
41501	A21D			"
41505	A221			"
41517	A22D			"
41524	A234	41581	A26D	"
41667	A2C3	41722	A2FA	Changes to RS-232 Output Byte routine.
42346	A56A			Change to INKEY$ routine.
44541	ADFD			"
45631	B23F			?
45966	B38E			?
46061	B3ED	46118	B426	Changes to INTCNV routine
47574	B9D6			Mod to floating point add.

Beginning DEC ADDR	HEX ADDR	Ending DEC ADDR	HEX ADDR	Description
				Map of areas that have changed between Extended Basic 1.1 and 1.0
32976	80D0	32989	80DD	
33023	80FF			
33042	8112			
34555	86FB			
35867	8C1B	35874	8C22	Apparent fix to DLOAD command
35921	8C51			"
37241	9179			
37245	917D			
38444	962C	38445	962D	Fix to PMODE command.
38563	96A3	38579	96B3	Fixes to PCLEAR command to eliminate ?SN error when executing PCLEAR in start of a program.

RECEIVED & CERTIFIED

The following products have been recently received by *the Rainbow*, examined by our magazine staff and approved for the *Rainbow Seal of Certification*, your assurance that we have seen the product and have ascertained that it is what it purports to be.

This month the *Seal of Certification* has been issued to:

Air Traffic Controller, a 32K ECB computer model of an air traffic control situation. Remotely piloted vehicles are operated by the controller in a situation similar to that of a commercial airline in that you must regulate landings and takeoffs of the vehicles. Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, tape $28.95

Buzzard Bait, a 32K ML game for one or two players. Objective: You are the bird and must fly with your joust, destroying enemies and capturing eggs of the enemy birds. Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, tape $27.95

Grabber, a 32K ML game for one or two players. Objective: You are the Grabber and must grab the eight treasures and store them in the center boxes. Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, tape $27.95

Devil Assault, a 16K ECB multi-level game with each level getting progressively more difficult. Objective: Defend your base from attacking bird-like creatures who eventually turn into the Devil and are out to destroy you. Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, tape $27.95

Cuber, CU * BER, a 32K ML arcade-type game. Objective: Help Cuber change the colors of the pyramid while avoiding the dangers of Vipers, the Nurd, and the Dork. Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, tape $27.95

Journey To Mount Doom, a 32K ML adventure type game. Objective: You must find and destroy the Nercromancer's lost gold ring, and discover the way to Mt. Doom before war is waged on the earth. Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, disk $27.95

Junior's Revenge, a 32K arcade-type game. Objective: Climb vines, avoid obstacles and creatures to save your father from the zookeeper. Computerware, P.O. Box 668, Dept. B2, Encinitas, CA 92924, tape $28.95

HyperZone, a 32K space game with nine skill levels. Objective: Fire torpedoes and shield your ship from the swarm of enemy ships in a deep space battle. Computerware, Box 668, Dept. B2, Encinitas, CA 92024, tape $26.95

Time Patrol, a 32K World War IV game in 2283. Objective: Fire machine guns and try to shoot down enemy planes while avoiding their bombs. Computerware, Box 668, Dept. B2, Encinitas, CA 92024, tape $26.95

The Sourcerer, a 16K program producing symbolic source code that can be assembled. It disassembles to disk, tape, printer, or screen. Position independent code and user defined symbol/label buffer area. Four formats: hex dump, ASCII dump, full listing and symbolic mode. Computerware, P.O. Box 668, Dept. B2, Encinitas, CA 92024, tape $34.95

The Color BASIC Compiler, a 32K program that allows you to write your own program in easy BASIC, then converts into machine language and will make your program run an average of 42 times faster. Includes a 27 page instruction manual. Computerware, Box 668, Dept. B2, Encinitas, CA 92024, disk $39.95

Dragon Cruncher. a cassette-based, menu-driven program that converts most Dragon 32 programs for use on the Tandy Color Computer and converts most Tandy Color Computer programs for use on the Dragon 32. Elkan Electronics, Freepost, 11 Burg New Road, Prestwich, Manchester M25 6LZ, tape $7.95

Microcom, a ML telecommunications in 6803 code which will enable the MC-10, with data-base services, B.B.S.'s and other host computers. This program has a memory-seeking function which automatically expands the buffer according to available memory area. The buffer may be opened and closed by the user while on-line for more selective use of memory. *Microcom* will also allow the user to scan the buffer and to dump information from the buffer to a printer. Micro Ten Software, 496 Amboy Avenue, Perth Amboy, NJ 08861, tape $19.95

TV Graphics Editor, a 16K program written to help create, modify, and correct graphics pictures in the same way that a text editor operates on the printed word. The basic principle behind the operation of this editor is the use of the joysticks for cursor control, and the use of the keyboard to control the editing functions, in conjunction with these cursors. International Software, 820 Dunsmuir Rd., Victoria, B.C., Canada, V9A 5B7, tape $27.95 - Canadian or $22.95 U.S.

Screen Two, a 16/32K program that provides enhancement of the CoCo's limited alphanumerics screen by automatically printing the letters in PMODE 4 and allowing a variety of print options and formats. International Software, 820 Dunsmuir Rd., Victoria, B.C., Canada, V9A 5B7, tape $14.95 - Canadian or $12.50 U.S.

Learning Games: Shapes, Words, and Counting, three 16K ECB educational programs designed for children in pre-school through elementary grades to help learn shapes, words and counting. DD Software, 10 Simonne Lane, Pepperell, MA 01463, tape $24.95

Disk Manager, a 16K menu-driven program that allows you to copy disk files from one disk to another, or from disk to cassette. Elite Software, Box 11224, Pittsburgh, PA 15238, disk $24.95

Programmers Worksheet, a worksheet designed to become the front page of your new program to help save time and to remember variable assignments, descriptions, subroutine locations, etc. CoCo Data Enterprises, 1316 Quail Avenue, McAllen, TX 78504, $1.50

Tutorcode, a 16K program that teaches International Morse Code to beginners and increases speed proficiency from 3 w.p.m. to 25 w.p.m. Rabbitt Ware, Inc., Rt. 1, Bascome Road, Jackson, TN 38305, tape $19.95

Early Games For Young Children, nine 16K educational games for children ages 2½ to 6. No adult supervision is required. The Picture Menu gives the children control. They can: match numbers, count colorful blocks, add and subtract stacks of blocks, draw and save colorful pictures, match letters, learn the alphabet, spell their names, and compare shapes. Counterpoint Software, Inc., 4005 W. Sixty-Fifth Street, Minneapolis, MN 55435, disk $29.95

Battery Back-Up, a battery back-up system for 32K/64K of memory without changes to your CoCo. Circuitry is contained in ROM-port cartridge with an on-off switch on cartridge, with LED indicator. Provides over two hours support time during power failures. Includes rechargeable battery. SAV-A-BYTE, 2857 Emanual Church Road, W. Columbia, SC 29169, $89 or $99 with bus extender option.

Holiday Script, a 16K ECB script writing program with upper and lowercase lettering and punctuation. Tampa Instructional Center, 201 East Linebaugh Avenue, Tampa, FL 33612, tape $8.95

Holiday Carolers, a 16K ECB program that draws a video display of Christmas Carolers. Tampa Instructional Center, 201 East Linebaugh Avenue, Tampa, FL 33612, tape $5.95

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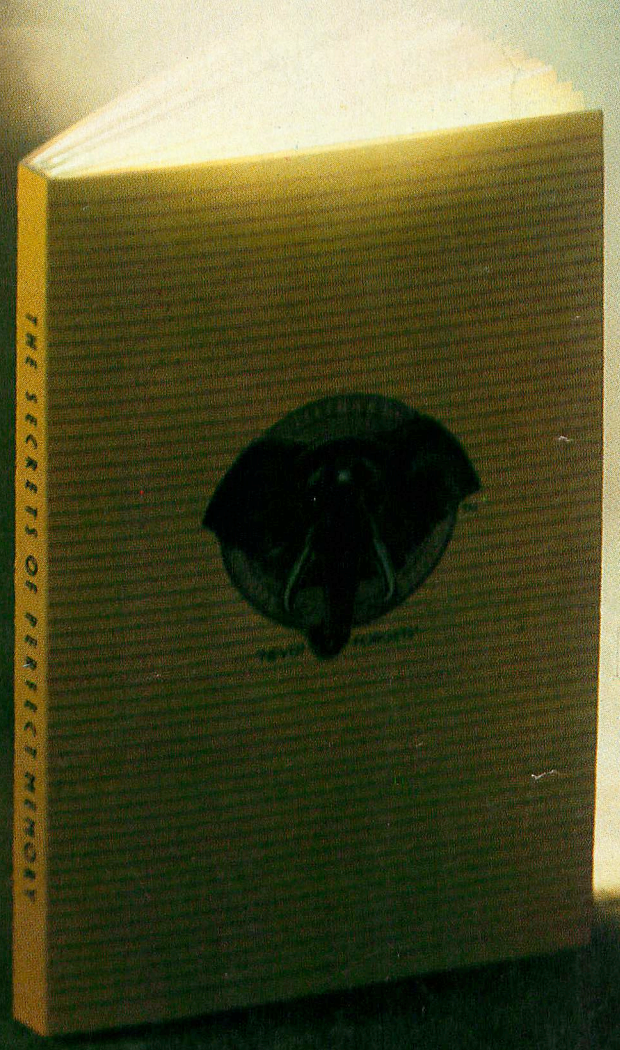

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